THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CIX. No. 2444.] LONDON, MARCH 15, 1910. [62ND YEAR. PRICE 6d.

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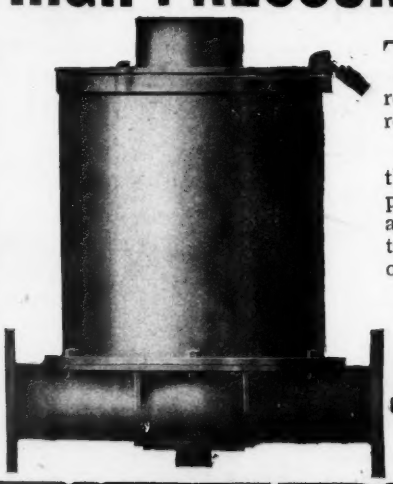

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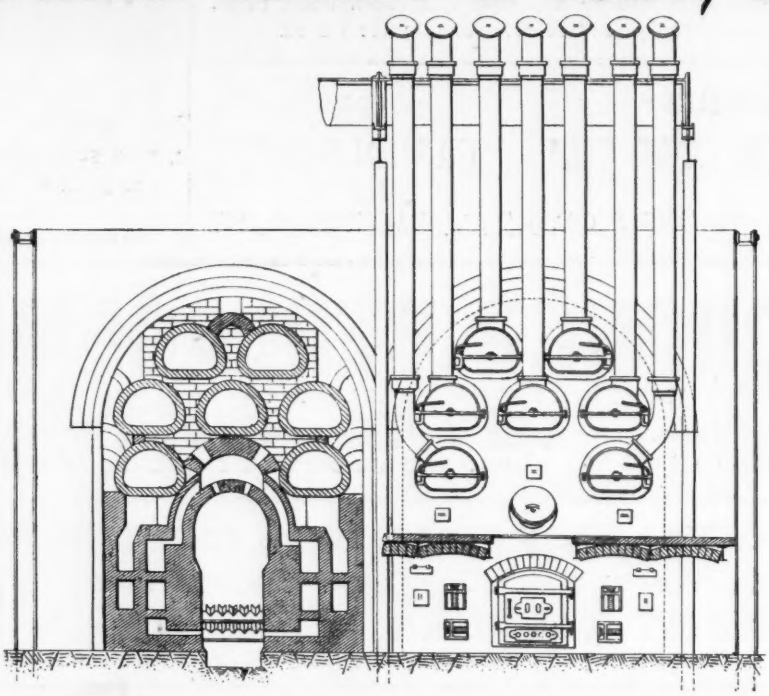

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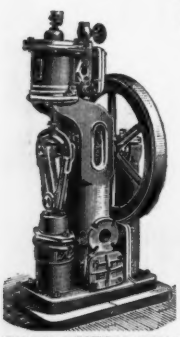

Fig. 705. "SINGLE RAM" STEAM-PUMP.

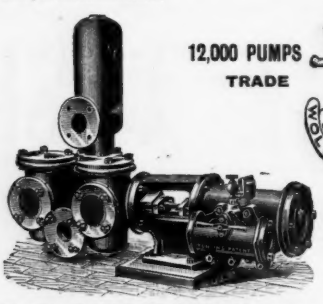

Fig. 596. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

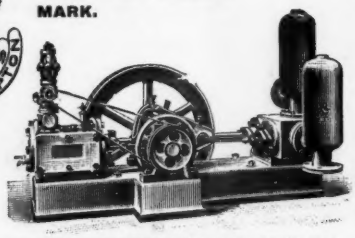

Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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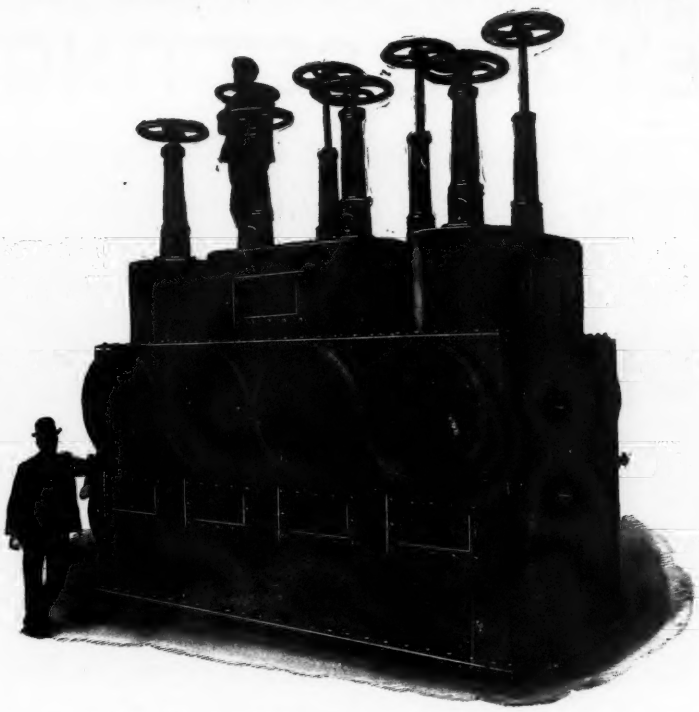

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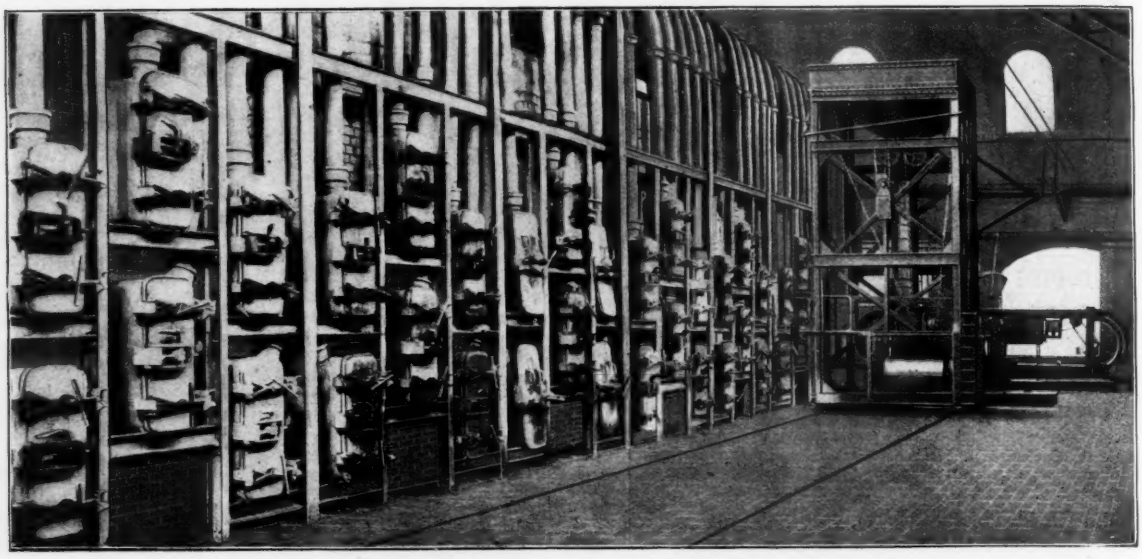

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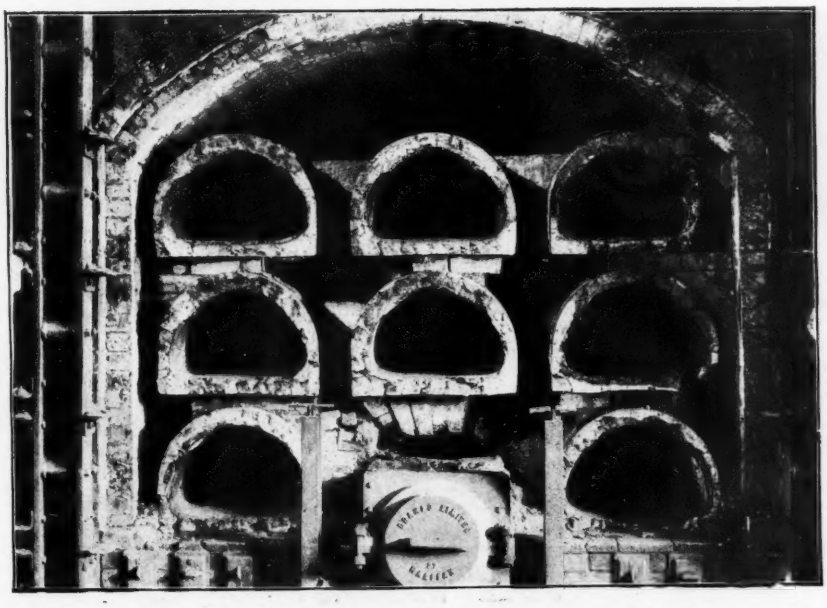

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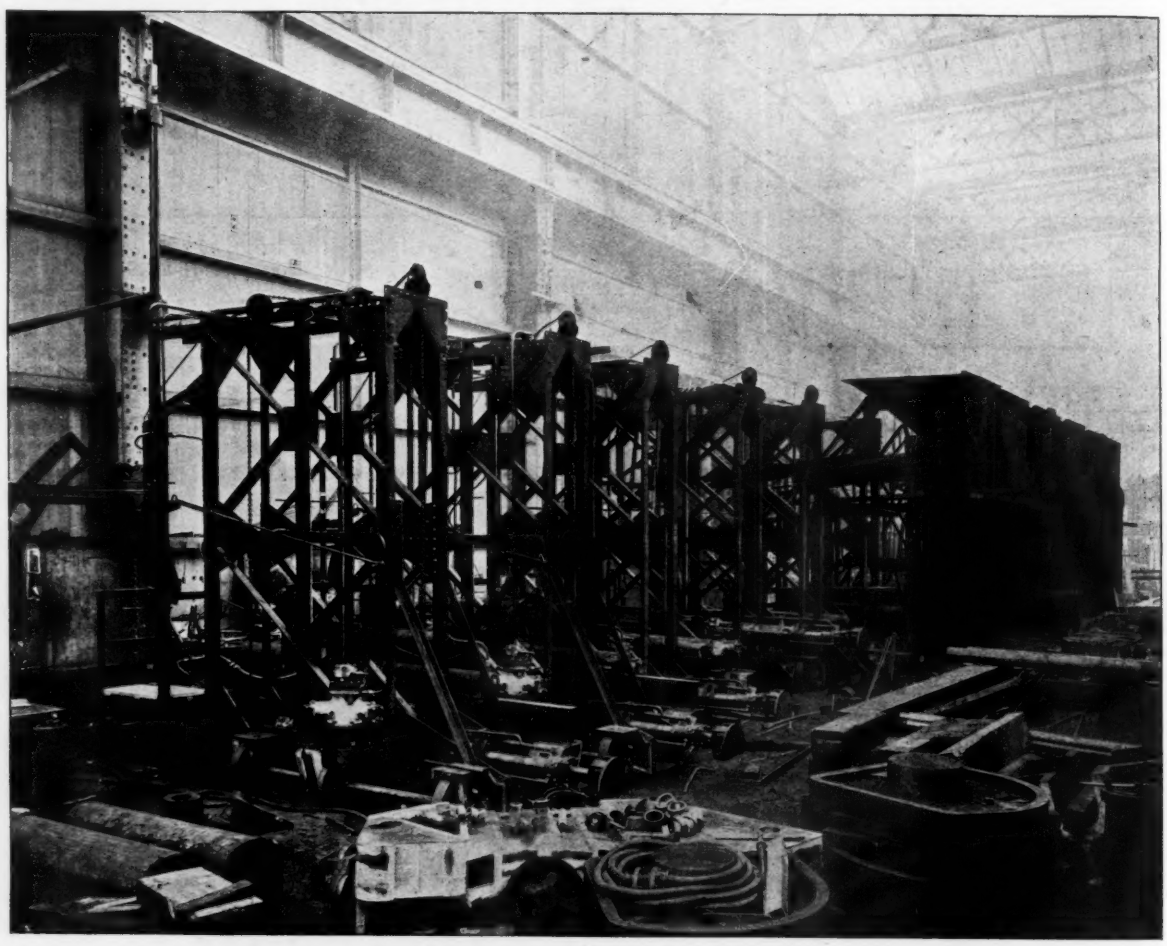

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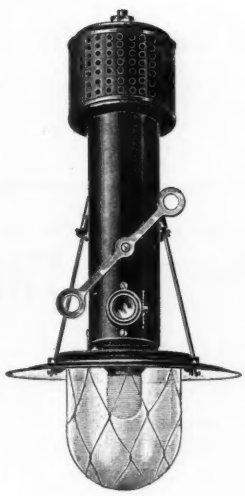

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The above are extracts from long technical and descriptive articles.

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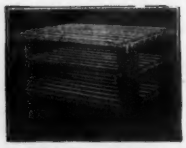

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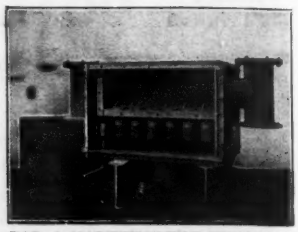

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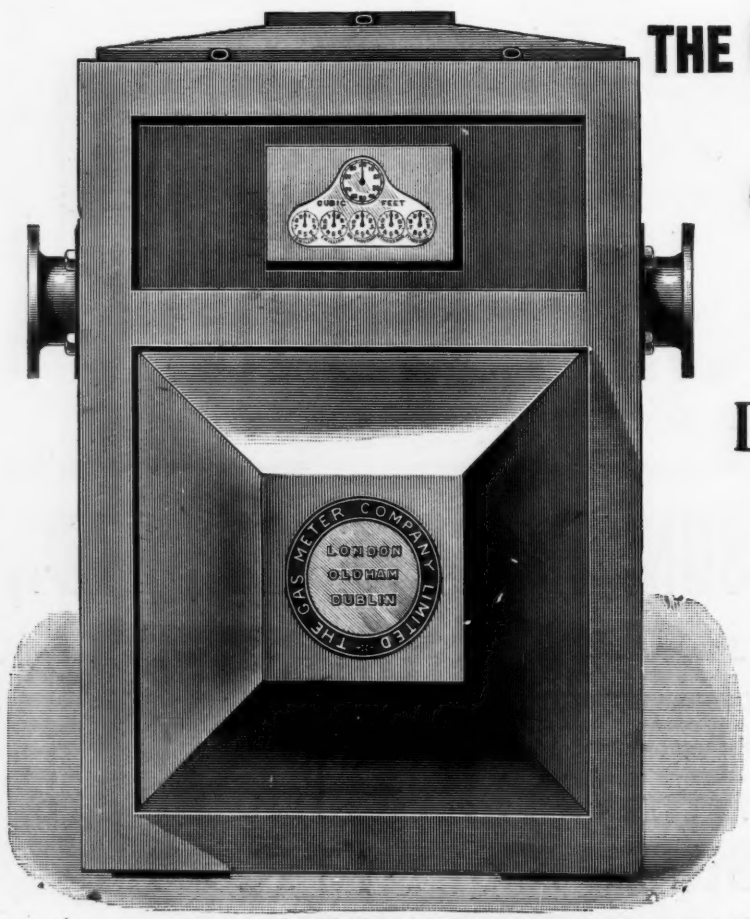

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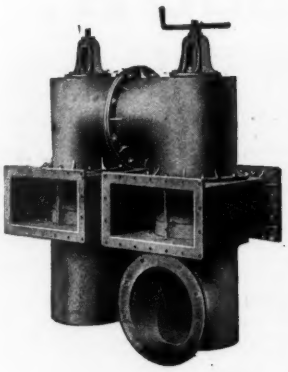

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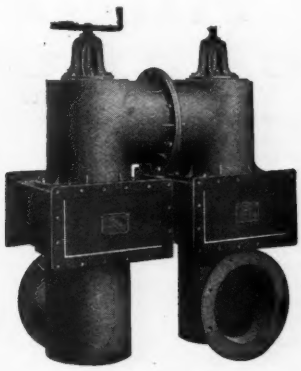

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Kiel (2nd)	880,000
L. & N.W. Rly., Crewe	700,000
Lausanne, Switz.	250,000
Lawrence, Mass.	400,000
Lea Bridge	350,000
Lea Bridge (2nd)	350,000
Lea Bridge (3rd)	400,000
Lea Bridge (4th)	1,000,000
Leeuwarden, Holland	400,000
Leiden, Holland	500,000
Leiden (2nd)	575,000
Leigh, Lancs.	350,000
Lemberg, Galicia	260,000
Lemberg (2nd)	500,000
Liége, Belgium	1,000,000
Liége (2nd)	750,000
Lincoln	500,000
Liverpool	3,500,000
Liverpool (2nd)	4,500,000
Liverpool (3rd)	750,000
Longton	600,000
Louvain, Belgium	800,000
Lübeck, Germany	400,000
Maastricht, Holland	200,000
Magdeburg, Germany	1,400,000
Maidenhead	225,000
Maidenhead (2nd)	225,000
Maidstone	500,000
Malines, Belgium	500,000
Malmö, Sweden	350,000
Malta	400,000
Manchester	3,500,000
Manchester (2nd)	3,500,000
Marlborough	100,000
Mayence, Germany	700,000
McKeesport, Pa.	500,000
Merthyr Tydfil	300,000
Middlesbrough	1,250,000
Namur, Belgium	175,000
Nelson	400,000
Newburgh, N.Y.	600,000
New York	5,200,000
Nictheroy, Brazil	250,000
North Middlesex	150,000
North Middlesex (2nd)	200,000
North Middlesex (3rd)	75,000
Norwich	1,000,000
Norwich (2nd)	300,000
Norwich (3rd)	500,000
Nottingham	1,000,000
Nottingham (2nd)	1,000,000
Nuneaton	125,000
Oberhausen, Germany	175,000
Oldenburg, Germany	200,000
Ostend, Belgium	100,000
Ostend (2nd)	200,000
Perth, W.A.	125,000
Poole	1,500,000
Port Elizabeth, S.A	400,000
Portsmouth	1,000,000
Posen, Germany	450,000
Posen (2nd)	700,000
Prague, Austria	140,000
Preston	1,400,000
Reading	1,000,000
Redhill	275,000
Redhill (2nd)	300,000
Reichenberg, Bohemia	200,000
Reichenberg (2nd)	200,000
Revel, Russia	350,000
Rhymney Valley	175,000
Romford	300,000
Romford (2nd)	350,000
Rotterdam, Holland	850,000
Rotterdam (2nd)	1,500,000
Rotterdam (3rd)	750,000
Rotterdam (4th)	750,000
Rotterdam (5th)	600,000
St. Albans	700,000
St. Gallen, Switz.	225,000
St. Gallen (2nd)	225,000
St. Joseph, Mo.	750,000
San Paulo, Brazil	700,000
Santiago de Cuba	400,000
Scarborough	800,000
Schwelm, Westphalia	100,000
Shanghai	225,000
Shanghai (2nd)	225,000
Shanghai (3rd)	1,600,000
Southampton	800,000
Southampton (2nd)	500,000
Southampton (3rd)	600,000
Southgate	400,000
Southport	750,000
Southport (2nd)	900,000
South Shields	650,000
Stafford	500,000
Staines	600,000
Stettin, Germany	880,000
Stockholm	1,500,000
Stockholm (2nd)	1,750,000
Stockport	600,000
Stockport (2nd)	600,000
Stockport (3rd)	400,000
Stockton-on-Tees	500,000
Swansea	750,000
Swansea (2nd)	1,000,000
Swansea (3rd)	450,000
Swindon	300,000
Sydney—Harbour	500,000
Sydney—Harbour (2nd)	500,000
Sydney—Mortlake	500,000
Sydney—Mortlake (2nd)	500,000
Syracuse, N.Y.	850,000
Taunton	225,000
Taunton (2nd)	350,000
The Hague Holland	1,000,000
The Hague (2nd)	500,000
Tilburg, Holland	400,000
Torquay	350,000
Tottenham	750,000
Tottenham (2nd)	750,000
Tottenham (3rd)	350,000
Tottenham (4th)	1,000,000
Tottenham (5th)	1,000,000
Tottenham (6th)	1,250,000
Tunbridge Wells	1,000,000
Utrecht, Holland	1,000,000
Utrecht (2nd)	1,000,000
Verviers, Belgium	1,000,000
Vienna	3,500,000
Vienna (2nd)	2,500,000
Waltham	400,000
Wandsworth & Putney	1,800,000
Watford	300,000
Watford (2nd)	350,000
Wellington, N.Z.	350,000
West Bromwich	550,000
West Ham	1,500,000
West Ham (2nd)	800,000
Weston-super-Mare	350,000
Weston (2nd)	350,000
Wexford, Ireland	100,000
Wiesbaden, Germany	850,000
Winchester	225,000
Winchester (2nd)	125,000
Wolverhampton	1,500,000
Zwolle, Holland	200,000
Zwolle (2nd)	200,000

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EDITORIAL NOTES—GAS, &c.

Independent Thoughts and Practices.

An independent and a searcher after truth are the impressions that one has received after listening to the Presidential Address that Mr. C. Stafford Ellery, of Bath, delivered to the Southern Association of Gas Engineers and Managers last Thursday. Both qualities are good in any man, and both are interlinked. The independent can only be so by being inquisitorial on his own account, and finding a backing for the attitude he takes. The searcher after truth is only so because, in the first place, he is unwilling to give credence to all he reads and hears without personal examination. The qualities disclose the active mind; and the active mind gives us the fruit of original thought and work. But however independent and active in mind a man may be, he cannot afford to sequestrate himself from his fellow men with similar pursuits. The fields of thought, of work, of application, are all broadened by intercommunication. The President, independent though he be, knows this well. Therefore in the forefront of his deliverance, he sets forth the value to individuals of organization and association. The need for association in the gas industry does not, with advancing time, dwindle in importance. It expands. New ground is being constantly opened up; practices are altering; conditions are mutable. Under such circumstances, it is good and necessary to take counsel together. It aids the engineer in reaping from collective experiences. The rapid march of invention and discovery the President finds almost bewildering; and this rapid march increases the difficulties of the individual engineer. It cannot be expected that one engineer can ever put upon trial all that comes before him. He has to proceed about this part of his work largely in the spirit of an eclectic, and choose from the aggregate of experience that which he himself shall put to the test. But though difficulties accrue with greater rapidity and more poignancy than before through developing advances, there are the advantages. There are not only the working economies, but, if productivity is increased by new invention, there is a reduction of capital charges. So that though the difficulties of professional position increase, there are valuable compensations. In this connection, Mr. Ellery emphasized the importance—an importance that is still insufficiently recognized in many undertakings to-day—of regularly writing-down capital and writing off sufficient sums for depreciation, not only in the manufacturing department, but in connection with stoves, meters, and slot installations. Gas administrators who saw the wisdom of capital economy in the time long ago, and who pursued the dictates of wisdom, are in these days of competition blessed by their successors. Those who did not, and were lavish in capital expenditure, have left nothing behind them in this connection for which their memories are to-day cherished. But in this inventive age, the responsibilities of engineers and of gas administrators generally are more momentous than ever; and there must be a care as to the legacy they confer upon those who will hereafter take up their work.

Passing on to refer to some of the technical matters touched upon by the President, he gave the relative costs of dealing with coke by two different forms of conveyor—showing that the costs of one were more per ton by 1·1d. than the other. A cross conveyor accounts for part of this extra cost; and the smaller quantity of coke transported by the more costly one, suggests also that it may have a less amount of work to do in a given time, which again would increase the operating expense. The particulars supplied are insufficient to form the grounds for condemnation of the one form of conveyor. It will also be interesting to learn that the President has run up the full gamut of hydraulic main method. From wet main to anti-dip, from anti-dip to liquor seal, and from liquor seal to tar seal; and in the last-named antiquated practice—a practice long since generally discarded on account of the robbery by the tar of some of the rich hydrocarbons of the gas—he is for the present reposing. It would be interesting to learn what effect, if any, he finds the reversion has had upon gas yield and quality. It is necessary to steam the tar to keep it liquid; and there can be little question that this steaming has also the effect of liberating some of the lighter oils from the gas, which in turn cannot lessen the necessity for naphthalene treatment, though the President claims some beneficial effect from the tar seal on the naphthalene contents of the gas. In this connection, there is endorsed the efficacy found by other gas engineers of treatment by water-gas tar, in practically eliminating naphthalene from the gas. The President, however, uses in his washer rather a large quantity per million cubic feet; and his excuse for this is that the naphthalene varies "very considerably from time to time, "and shows some unaccountably sudden changes." This seems to reflect somewhat upon the President's faith in the tar seal. Then the further precaution is taken of vaporizing into the gas some 10 gallons of benzol per million cubic feet of gas. Immunity from naphthalene troubles at any price is obviously the policy of the President; but when he sets against the cost the freedom he enjoys from stoppages (stoppages representing a not inconsiderable item of expense) and the added illuminating power of the gas, he is well content. Perhaps, however, when mains and services are thoroughly cleared, the cost of this comprehensive treatment for restraining the freakish naphthalene will diminish.

The President subscribes to the value of the high-pressure system of conveying gas; and in this connection he advances the results of a number of tests made some time since to prove the accuracy of the theoretical formulæ—Pole's and Cox's—as to the capacity of the new mains and the discharge at varying pressures. The general conclusion derived from the tests is that there are so many conditions peculiar to any particular piece of pipework that the theoretical formulæ and the actual working capacities and discharges have not the relationship that admits of any reliance being placed on the former. Concerning certain of the concluding parts of the address, the gas industry will not regard with any great amount of satisfaction the results of Mr. Ellery's investigations; but it will undoubtedly have the good effect of directing the attention of other gas engineers and managers to the importance of making tests for themselves of meters, cooking-stoves, and burners, to ascertain precisely those quarters where the greatest accuracy and efficiency are to be obtained. The statements made as to the hourly consumption of certain cooking-stoves reflect lax method and crude design; and the extraordinary consumptions of certain stoves, a want of consideration for the interests of the gas industry. The fact that there are many stoves on the market possessing excellent efficiency is the positive proof that only indifference in production is at the bottom of the grotesque consumption of certain other makes. We have corroborative tests from a totally different quarter. It is to be hoped there are not many stoves of the kind on the market; but such work as Mr. Ellery has done should soon result in the transference of patronage, which is the most salutary method of enforcing necessary care. The same remarks will apply to incandescent gas-burners. Upon his experiences in the testing of meters, the President added his plea for the amendment of the Sales of Gas Act; but, in connection with this matter, the defects in registration found by the tests are shown to be more in favour of the gas consumer than of the gas purveyor.

Other topics that supplied the President with material were municipal trading and the "Metropolitan" No. 2 burner. As to the former, Bath unfortunately is not an isolated illustration of the robbing of ratepayers in the name of municipal trading. The reflections of the President on this subject are stated with a directness that will not make pleasant reading for those who sit in the high places in the present

government of the historical city; and they will find the utmost care has been exercised by the President in stating the facts. While electricity supplying local authorities are doing their best to injure local gas undertakings by their methods of competition and by increasing the burdens of the ratepayers (of which the gas undertaking is frequently the largest), they are hostile to gas undertakings applying to their business the modern gas-testing burner that has both scientific and parliamentary ratification. And the President also finds that there is no burning desire on the part of these same local authorities to obtain greater stringency in the testing of the lighting and heating values of electrical appliances. That is an anomaly to which the local authorities should give full consideration. Every point upon which the President touched in his address would form a text for extended comment; and, with the multiplicity of subjects, practically nothing more than an indication of their character could be attempted here. The verdict of our readers will be that of the members of the Association—that the address is an attractive and useful contribution to the current technical literature of the industry.

Street-Lamp Tests from Westminster.

We have no great faith in photometrical tests of street lamps *in situ*; experience having convinced us that many extraneous circumstances creep in to vitiate results and render them uncomparable. Years ago we had to take serious objection to tables of street photometrical tests that had been made by, or under the supervision of, the City Engineer of Westminster (Mr. J. W. Bradley, M.Inst.C.E.). After a long interval, there has been received from him, and we have reproduced in large part, a further tabulated statement of tests of street-lamps (gas and electric), with the comparative costs extending over a period of seven-and-a-half years. It may at once be said that, subject to the qualification in the opening lines of this article, objection cannot be urged against these tests with weight equal to that advanced some few years since. The tests are peculiarly informative. In the first place, it is noticed that the latest type of high-pressure gas-lamp tested is that in Aldwych and Kingsway; so that, in respect of high-pressure gas lighting, the latest achievements are not included in the tests. We are not without hope that the photometrical trials that were being made of the high-pressure inverted lamps in Fleet Street a few nights since were on behalf of Mr. Bradley, and that, both in average candle power and in cost per candle power per annum, they will have given superior results to anything that can be found in the City of Westminster.

The next point to which readers' attention may be specially directed are the two columns in the table referring to nominal candle power and average candle power as measured. It will be noted that a wide gulf exists in most instances between the relative figures under the two headings in the case of the electric arc lamps. A very bad case is the one for which the greatest total amount of money is paid per annum, in which the nominal illuminating power per lamp is 1000 candles, while the average candle power as measured is only 449 candles. There are two instances of arc lamps in which there are moderate excesses of illuminating power as measured over the nominal—the excesses being only 11 and 73 candles. The same wide differences are not found in the case of the high-pressure gas lamps (though not of the most modern type). As a matter of fact, the Parliament Street nominal 900-candle high-pressure gas-lamps are credited with an average actual power of 983 candles; the Aldwych and Kingsway lamps, for which a nominal illuminating power is claimed of 700 candles, are returned as giving an average of 1151 candles; and the Parliament Square high-pressure lamps, of 700 nominal candle power, give an actual illuminating power of 995 candles. The relation between the nominal and actual illuminating power figures should be particularly interesting to our electrical friends; and perhaps a little homily, addressed by our contemporaries to the makers of arc lamps as to their nominal claims, would not be out of place.

The illuminating power as photometrically tested and the refinement as to cost per candle power per annum are not the only matters to be considered; the questions of distribution, reliability, and effect under the worst of our fickle climatic conditions are of no small importance. But we will not ignore the cost per candle power per hour for the last quarter. Looking down that column, it will be remarked that it is only the exceptionally high-power flame arc lamps that beat the latest of the forms of high-pressure gas-lamps included in the table; and the efficiency of these lamps (by Mr. Bradley's measurements) only ranges from 30 to 38 candles per cubic foot. The Fleet Street inverted lamps are giving from 60 to 70 candles per cubic foot of gas consumed; and gas is being supplied to them at a cheaper rate now than during the period covered by Mr. Bradley's data for Westminster. Under these circumstances, though we do not give much weight to such figures, we are hoping to see that the new high-power inverted gas-lamps in cost per candle power come out level with, if not superior to, the best the flame arcs can show (notwithstanding the low prices at which current is charged up for them), with, in addition, greater reliability and efficiency to their credit during the worst of our atmospherical conditions, when in the City of Westminster "flares" have been occasionally requisitioned to assist the electric lamps.

Mr. Bradley makes some observations relative to the condition of mantles causing a considerable variation in illuminating power, particularly where there is a cluster of mantles in one lantern. In reference to the high-pressure lighting, he seems to have devoted considerable attention to the Aldwych and Kingsway lighting; having made of these lamps the highest number of photometrical tests of any class (525 tests). Seeing that the average from actual measurement is 1151 candles, while the nominal power is only 700 candles, there does not appear to be much to complain about there in regard to the mantles. In the newer form of high-pressure inverted lamps, the mantles are single, and are suspended from a ring; and though we think that Mr. Bradley has made overmuch of the point in connection with upright mantles, he will find with experience of inverted gas-lamps that it will be necessary to considerably modify his statements. But as against these comments on mantles, reference letter "*d*" in the table informs us that many of the electric arc lamps referred to were of very poor candle power during the quarter; and the double 32-candle power electric lamps against which the letter "*e*" is placed, have the comment passed upon them that the "lamps were "too poor to read for testing purposes. Globes to lanterns "very dirty." The difference between nominal and actual candle powers of the arc lamps is also a point of which sight will not be lost.

We remember that Mr. Bradley at one time was a strong advocate of high-power sources on high columns for street illumination. We are not without hope, in view of this last report, and the fact that it does not refer to the latest systems of gas lighting, that Mr. Bradley will yet be convinced that for all-round efficiency what he requires can best be realized by inverted incandescent gas-lamps. The Berlin City Fathers have come to that conclusion, after a fierce battle between the rivals; and there is no reason why a similar result should not obtain in Westminster.

High-Pressure Gas for Industrial Operations.

Occupying a unique position as the Engineer in charge of the Woolwich Arsenal Gas-Works, there is no one perhaps who has more favourable opportunities for the study of the application of gas for furnace heating, and for purposes large and small, than Mr. A. W. Onslow. The application of gas for heating in industrial work is an important one in these times; and gas undertakings in large industrial centres—such as the Sheffield Gas Company and the Birmingham Corporation Gas Department—are doing much in various ways to cultivate new business in this direction. But Mr. Onslow thinks the gas industry has been negligent in this matter. He administers his castigation with right good will. There has been too much that is haphazard and crude about methods and practices in industrial furnace heating by gas; and haphazard and crude methods and practices are uneconomical and inefficient. We have all this in the paper that Mr. Onslow read (as well as in the asides of the author) the other day before the Society of Chemical Industry; and it cannot be gainsaid that in the results he obtains from practices developed from his own researches, Mr. Onslow makes his point. He deserves to be thanked no less for his plain-spoken criticisms, and his encouragement to better service in the industrial heating field, than for the notable achievements in efficiency and economy that have issued from his work. If industrial heating is worth having by the gas industry, it is worth carrying out in a scientific manner; and in Mr. Onslow's paper we have the science of the matter put clearly and tersely. The secret of the

heating of industrial furnaces is constancy of pressures, and constancy of pressures means constancy of temperatures. The pressures, too, must be high, and regulated to the particular purpose to which the temperature has to be applied. Under these circumstances, furnace temperatures will (with properly designed apparatus) be constant, will be equal throughout a furnace, and will be reproducible; and the results will be definite. In other words, by these means certainty displaces uncertainty, and a precise efficiency, something that is problematical—no matter whether one or more furnaces is or are used, and no matter whether a number are being employed simultaneously at different temperatures. Mr. Onslow tells us how it is done; and his paper is packed with practical wrinkles and guidance to the making of a successful business of industrial heating, by working under known conditions, by economizing gas and time, and by realizing efficiency.

The gas industry, in his judgment, is not doing enough in this matter. It is trying to meet modern requirements by old principles and customs. These have to be overthrown; and the new ones that he advocates as the outcome of personal extensive work, must be set up. He looks for the time when isolated compressing plants will not be needed for industrial work; when high-pressure gas will be supplied to factories as an advance necessary and compatible with modern conditions and ideas. Under the circumstances of urban development, factories cannot be brought to the gas-works; but high-pressure gas can be conveyed to the factories. The Gaslight and Coke Company have been carrying gas at high pressures to the printing-works in the neighbourhood of Fleet Street for melting the metal for stereo and other work. The Birmingham Corporation Gas Department are laying a 4-inch high-pressure main, for conveying gas to the jewellers' quarter in the city for heating purposes. With reference to this latter development, when further advanced, we hope Dr. W. B. Davidson, the Chief Chemist to the department (who, with Mr. S. R. Barrett, the Distributing Superintendent, has taken an active interest in the matter), will give the gas industry the benefit of experiences. But the supply of high-pressure gas is not enough; the provision of proper furnaces and appliances for the work to be accomplished is required. "Much harm has been done," avers Mr. Onslow, "through useless methods of furnace "heating that seems almost incomprehensible." Makers of such furnaces and appliances will not be disposed to sit quietly under the scathing dismissal and denunciation of their work in this respect, and will naturally point to the increasing demands for their goods in this line as rebutting evidence. Their defence may be safely left to themselves. In the design of furnaces and their arrangements, a feature to be kept in view is to render them as independent of the man as possible, and to make them perfectly controllable. That is a lesson the gas industry has learnt in other directions; but in this particular one of the industrial use of gas for trade heating, the industry has regarded their duty ended in the giving of a constant supply of gaseous fuel, and leaving the design of the appliances for its use to those intimate with the necessities. Putting a plain meaning on Mr. Onslow's assertions, the latter have not been very successful in their designs; and if the gas industry is to make a flourishing business in industrial heating, it follows that its technical chiefs will have to step over the borders of their profession, and make acquaintance with the technicalities within the bounds of the heating requirements of the manufacturers in their areas. There is no insuperable difficulty about this; but Mr. Onslow must not forget he practically lives in Woolwich Arsenal, and his opportunities are great for acquiring special knowledge of industrial heating necessities outside his own particular province as a gas engineer.

The use of high-pressure gas for lighting was not of the subject-matter of the paper; but it was introduced. When it is remembered that their remarks apply to Woolwich Arsenal, with its spacious shops and heavy work, the testimony of Colonel Bagnold and Colonel Sir H. Barlow as to the superiority of high-pressure gas lighting over electric lighting is valuable. If the former is the means of lighting *par excellence* for the shops of the Arsenal, then it must be the superior system of lighting for all other large factories and shops where high-power sources of illumination are required. The positiveness with which the two gallant officers delivered themselves on this point leaves no opening for doubting the sincerity of their tribute. Said Colonel Bagnold: "For factory and workshop lighting, his friend "Colonel Barlow would agree with him that electric light "was 'not in it' with high-pressure gas lighting." And Colonel Sir H. Barlow not only agreed, but was even more emphatic than his friend. He remarked that "he would "never dream of putting in electric light now for factory "illumination. With high-pressure gas-burners for lighting "workshops, there was absolutely no comparison. He would "no more think now of putting in arc lighting than think "of flying. High-pressure gas gave a beautiful and steady "light." Declarations of this kind are helpful in carrying home to other manufacturers the fact that there is something to be said for high-pressure gas lighting that should be favoured with consideration when the agents of electricity suppliers are hovering around endeavouring to book fresh patronage.

In another part of the paper, the question of the use of high-pressure gas for warming large halls and rooms was treated upon, in relation to a project of Colonel Bagnold, whereby a combination system of steam and gas heating is arranged. Through the injector action of high-pressure burners, the heat generated in a combustion chamber and the hot products of combustion (after some part of the heat has been absorbed in heating water in a boiler for the hot-water circulating system) are made to travel at a high velocity through a long length of metallic tubing running through a room; and the products issue at the other end of the piping almost denuded of thermal value. It is found to be an economical system of heating. But what effect has it upon the humidity of the atmosphere?

Port of London Dues and Coal Supply.

THE schedule of port rates framed by the Port of London Authority is now under inquiry, on behalf of the Board of Trade, by Lord St. Aldwyn; and the formidable task his Lordship has before him is seen by the fact that no less than 223 objections have been lodged by representatives of public and commercial interests all over the country. The amount of opposition that the provisional schedule has engendered must not be taken to indicate altogether any deep-seated seriousness with which the proposals are generally regarded, but rather that every branch of trade and commerce is fighting for the most moderate terms that can be obtained. The Port Authority must carry on the work with which it has been entrusted by Parliament, and to do so there is no question that there must be an increase of revenue. But if we take coal alone, the Port Authority in putting forward its suggested maximum charge, has not, it is evident, sufficiently taken into account the gravity of laying too heavy a rate upon coal brought into London coastwise. A heavy rate on coal must, in some degree, be detrimental to the trade of London (which is just one of those conditions that it is not to the interest of the Port Authority to influence); and it must also bear hardly on the myriads of poor householders, who already feel keenly enough the burden of their fuel bill, and are oppressed by the sensitiveness of the coal market to all inflictions, positive or anticipated. The extent, too, to which the burdens of industry affect the price of gas has its ultimate effect upon the pockets of the consumers. The three London Gas Companies, the Brentford, and others, have been before Lord St. Aldwyn, to plead for some remission of the maximum rate on coal. Counsel, on their behalf, argued much to the point; and Mr. Charles Carpenter (the only witness called by the Counsel for the Gas Companies) made a most effective statement and claim on behalf of both the consumers and the Companies. The latter had a case quite distinct from the ordinary coal dealers and retailers, seeing that their public service is for London and the suburbs alone, with earnings in the way of dividend limited by the efficiency of their service, and the opportunities offered by their respective allocated districts. The Companies do not claim to be altogether exempt from some contribution to the expenditure of the Port Authority; but they do say that it should have some relation to the benefits that the work of the authority may confer upon them. As a matter of fact, there is little concrete advantage to be derived by them from this work. The case presented by the Companies is reported at length elsewhere; and there is no question that it assisted Lord St. Aldwyn to the conclusion that the proposal of the Port Authority in regard to coal is too high, and that it would be his duty to recommend to the Board of Trade a considerable reduction. The principle he has laid down, that there should not be a large margin in the case of coal between the maximum

rate and the rate actually charged, is a good one; and it will eliminate almost completely the uncertainty that would result from the reverse order of things. So far the Companies, in regard to the maximum rate, have therefore been partially successful; but interest will have to be suspended to see the actual outcome of the decision. Exemptions claimed in respect of the Lea, Medway, and Swale were not favourably entertained.

Popular Lectures and Illumination Costs.

In popular lectures, such as those Professor Silvanus P. Thompson has been delivering at the Royal Institution, one does not look for much that is technically new, and in the final lecture (as reported last week) there was a great deal that has been previously published in the learned lecturer's presidential address to the Illuminating Engineering Society, and in the reports of the "Glare" discussion that took place at recent meetings of the same organization. These things are excusable, and are expected. But we do submit that, in disseminating at such popular lectures relative figures as to costs for gas and electric lighting, recognition should be made of the more modern advances of gas lighting; and we protest now (as we similarly did at the time Mr. Leon Gaster delivered his London Institution lecture) against the figures that Professor Thompson presented for gas lighting in his final lecture at the Royal Institution. He gave the cost of high-pressure gas lighting per 1000 candle-hours at 1¼d., with gas at 2s. 6d. per 1000 cubic feet, as compared with 1d. for electric flame arcs, with electricity at 4d. per unit. This 1¼d. for high-pressure gas is worse than the 25,494 candle-hours for 2s. given for the "Millennium" light by Professor Thompson in his British Association lecture in 1906. So that gas has, according to his figures, receded in efficiency. But the fact is that the lecturer has not taken note of the efficiency of modern high-pressure inverted lamps—60 candles, or rather more, per cubic foot of London gas. Some actual figures from an installation at West Ham, published by Mr. H. N. Clark, in his Southern Association paper in November last (see "Journal" for Nov. 9, p. 396), showed that, with gas at 2s. 8d. per 1000 cubic feet, 45,000 candle-hours was obtained with an expenditure for gas of 2s., while the motive power cost only 0·76d., with an average use of twelve mantles per burner. Then in these Royal Institution figures, we have low-pressure incandescent gas lighting quoted at 3d. per 1000 candle-hours, which again shows that no account has been taken of the inverted incandescent burner. Of gas at 2s. 6d. per 1000 feet, 3d. will purchase 100 cubic feet; and taking an efficiency of only 20 candles per foot, the 100 cubic feet would represent 2000 candle-hours. So that if a fair reduction of this last-named figure is made for maintenance, the 3d. is altogether too excessive for 1000 candle-hours. Professor Silvanus Thompson has modified his figures considerably for electric lighting since 1906. In that year he credited electric flame arcs with 47,169 candle-hours for 2s.; now he quotes 1d. for 1000 candle-hours. This represents 24,000 candle-hours for 2s., which is vastly inferior to the West Ham figures already cited for high-pressure inverted gas-lights. Take the "Osmium" lamps, 6d. per 1000 candle-hours is now put forward, which is equal to 4000 candle-hours for 2s. In the 1906 lecture, 7143 candle-hours for 2s. was the figure named. It is pretty clear that the figures for electric lighting have been revised by Professor Thompson; but those for gas lighting require further revision by taking into account modern developments of inverted gas-lamps. We make this protest, and point to the need for revision of the gas figures, with all respect, as notwithstanding Professor Thompson's close identity with the electrical industry, we have always associated with him, his writings, and his public utterances a marked spirit of independence.

Annual Meeting of the Gas Institution.

We are reminded by the receipt, just before going to press, of a copy of a circular-letter from the Secretary of the Institution of Gas Engineers (Mr. Walter T. Dunn), that three months from to-day, Tuesday, June 14, the opening sitting of the annual meeting will be held, under the presidency of Mr. James W. Helps, M.Inst.C.E., of Croydon, in the hall of the Institution of Mechanical Engineers. Distinct from the technical and other interest associated with the proceedings, there will be a particular desire on the part of the members to do honour by their presence to a President who has laboured so sedulously—with much personal sacrifice, but animated solely by delight in the work—over a long course of years for the cause of technical organization in the industry. Support we are sure will be also extended to him in preparing, with the Council, the technical programme for the meeting. Members will observe in this preliminary circular that those who have communications to offer for reading and discussion are asked to send in the particulars not later than April 9 for placing before the Council. Apart from general knowledge of the fact, recent presidential addresses before District Associations show that there is no lack of material in connection with current technical and commercial movements and problems in the gas industry upon which discussable papers can be founded. On the Tuesday evening there will be a reception by the President and Mrs. Helps; and arrangements are being made for the customary excursion on Friday. One other matter remarked upon in the circular will, we hope, incite fresh interest in the Benevolent Fund. It is not at all pleasant to read such words as these in connection with a flourishing industry: "Unfortunately, the [Benevolent Fund] Committee, owing to insufficient subscriptions and donations, have been unable to deal with all the applications for assistance received during last year; the expenditure exceeding the income by £19 8s. 1d." The words above should be sufficiently stimulating to produce what is required.

Visit of the German Association.

Almost strangers at one time, there has been of recent years much interchange of courtesy and intercommunication in respect of common interests between the members of the gas professions of this and neighbouring Continental countries. We are glad to see from the circular referred to in the preceding paragraph that arrangements are being made to continue these desirable conditions during the summer of this year, by a visit to London of the members of the German Association of Gas and Water Engineers. The action of the Council in issuing this invitation will be unanimously endorsed by the members of the Institution generally, and most heartily by those eighty or so members who had the good fortune to visit Berlin in 1908. To speak of the attention and generous hospitality of our German friends on that occasion inadequately expresses the abounding warm-heartedness and good-fellowship that were met with on all sides. The invitation has been cordially accepted by our German colleagues; and the members of the Association have been circularized to ascertain how many will be able to join in the excursion. The only point for regret is that it is impossible for them to be with us in June at the time of the Institution meeting, owing to their own annual meeting having been arranged to be held at Königsberg the same month. But the next best thing is that they will be in this country towards the end of May; and their reception will be marked with no less sincerity in May than it would have been in June. The only difference will be that there will not be in London in May such a large number of gas engineers representative of the gas industry all over the British Isles as there will be in June.

The Close of a Coal Strike.

The welcome news reached here yesterday that the coal strike in Australia had terminated, and that work will be resumed this week. Thus ends another chapter in industrial warfare, which should stand forth for all time as a shining example of how not to do things. We say the chapter is "ended;" but this is, of course, only partially correct, as masters and men must for some time yet continue to feel the effects of so disastrous a struggle. One authority estimates the loss of wages entailed at over a million pounds, of which the miners will have to bear three-quarters; but it is not possible to say what the loss to trade generally is in cases of disturbances of this character. Among others, the gas companies have naturally suffered severely. As reported last week, the Chairman of the Australian Gaslight Company stated that, if the Company had doubled their charge for gas, it would not have recouped them for the enormous additional outlay incurred; and now we see from the report of the meeting of the Metropolitan of Melbourne Gas Company that in the past half-year's accounts £9500 has been set aside to partly meet the extra expenditure on coal during the strike. What this disastrous affair would ultimately cost them, the Chairman

added, it was impossible at that time to say. Apart from the effect of this unhappy labour dispute, the position disclosed by the Chairman of the Melbourne Company is gratifying in every respect. Rapid progress is being made, which, he says, is largely owing to the keen manner in which the staff devote their energies to the work of the undertaking. The record for the last three years is certainly one justifying pride on the part of all concerned—24,246 additional meters having been installed, which represents an increase of about 35 per cent. The total quantity of gas sold in 1909 was 1694 million cubic feet, as against 1563 millions in 1908, or an increase of about 8½ per cent. Upon the success with which work has been carried on during the coal strike, the Directors and officials will be congratulated, as well as upon the excellent results just referred to. The half year must have been an anxious one for all connected with the undertaking.

Midland Junior Gas Association.

The business of the fifth session of the Midland Junior Gas Association was brought to a close with last Saturday's meeting, though there are still two visits to be paid before the programme is finally completed. While looking forward, as the members are doing, to these future outings, it is meanwhile possible for them to look back and take stock of the past six months' work; and such a review of the session cannot fail to give them satisfaction. The papers read have not been over-numerous; but they have certainly been of excellent quality, and on subjects of the greatest possible interest to the members. The construction of a retort-house, calorimetry, and competition and the development of gas sales, are all subjects which are uppermost in the minds of those connected with the gas industry. Thus it is not surprising that the discussions have all been long, when one calls to mind the number of good debaters that are included in the membership of the Association. The paper last Saturday, which dealt with "Competition and the Development of Gas Sales," led, perhaps, to the longest discussion of all, and many interesting points were brought out. In speaking thus of the papers, mention must not be omitted of the first-class Inaugural Address which was delivered by the President (Mr. A. O. Jones, of West Bromwich), which formed the subject of an editorial notice in our columns at the time. The visits so far undertaken have, too, been of a most instructive character; and there is no reason to anticipate that the remaining fixtures will prove less valuable. At Coventry, the members have seen a new splendidly arranged gas-works; while at Messrs. Hardman's tar distillery much useful information was gleaned with reference to the working-up of products. The annual report of the Council showed that there are at the present time 133 ordinary members. This is seven less than the preceding year, which, however, constituted a record. A new rule has now been adopted which will extend the scope of the Association by relaxing the qualifications for membership so as to include a much wider range of gas-works employees. Inasmuch as the Junior Associations' chief claim is that they are educative, it seems a move in the right direction to welcome all those engaged in gas manufacture, &c., who are sufficiently keen about their work to desire to get on. The standard maintained by the Midland Juniors is a high one; and many who have hitherto been obliged to remain outside, will no doubt be glad of the opportunity of joining in the benefits to be derived from membership.

Unprofitable Electricity Supply at Newport (Mon.).

In the last number of the "JOURNAL," brief reference was made to a report by Mr. C. P. Sparks on the position of the electricity undertaking of the Newport (Mon.) Corporation. The fuller notice of the report, the proceedings of the Town Council thereon, and the remarks of the Secretary of the Ratepayers' Association which appear elsewhere to-day, throw additional light on the working of the Corporation Electricity Committee. Mr. Sparks reports that, in order to meet the existing deficiency and provide for reserves, the revenue this time last year should have been increased by £4189; but, to minimize the risk of losing business, he recommends that the charges should be raised so as to produce increased revenue at the rate of £2905 per annum. The Corporation have followed the advice of their expert to the extent of advancing their charges about 12 per cent.—that is to say, they have not gone much more than half way towards placing their electricity undertaking on a right financial basis. It would seem almost as though they were afraid to go farther lest the ground should be taken up by the Gas Company. And it must be confessed that we should regard such a result as not altogether unmerited, for the Company have had a hard fight during the past five years against a Corporation Department who were selling their commodity below cost price, and who grabbed all the big central consumption owing to their system of making good deficiencies out of the rates and putting forward great promises of future reductions. That the Company not only maintained its prosperity during this period, but actually went ahead, is evidence of the soundness of the concern, the capacity of its conductors, and the utility and popularity of its commodity. We do not for a moment question the business ability of the members of the Electricity Committee. But, in view of the light that has just been thrown upon their doings, we cannot help regarding them as men who, having taken the wrong road, would not retrace their steps until circumstances made a return an absolute necessity.

Professor Dixon and the Manchester Junior Association.

At the Victoria University, Manchester, an address was delivered to the members of the Association on Saturday afternoon by Professor Harold B. Dixon, M.A., F.R.S., who took for his subject "Some Theories of Combustion of Gases." Mr. James Taylor (Mossley), President, occupied the chair, and at the conclusion of the lecture—a summary of which will be given in our next issue—expressed the pleasure it had given him to again hear the Professor deal with a matter of such interest to those connected with gas undertakings. Mr. D. V. Hollingworth, F.C.S. (Salford), in moving a vote of thanks to Professor Dixon, expressed regret that more members had not been able to avail themselves of the opportunity of hearing the address that afternoon. They were, he added, greatly indebted to the Professor for having given so freely the results of his labour in the laboratory; and he desired to convey to that gentleman the cordial thanks of the members for the trouble he had taken. For himself, he had been particularly interested in the remarks upon the compression of gases, and also the slides that had been thrown on the screen showing the various explosive waves, &c. Mr. J. Alsop (Stockport), in seconding the motion, referred to the benefits that were to be obtained by the chemist and engineer working together—giving a case in point, illustrative of how such a union of the two professions would have saved considerably in material and in money. The resolution was carried with acclamation. In responding, Professor Dixon agreed with what Mr. Alsop had said, and gave another illustration in support of the contention. He expressed the hope that in the future there would be a closer union between the University and the Gas Associations, feeling sure that the results would be of the greatest assistance to both professions.

The Yorkshire Junior Gas Association will meet at the Leeds Institute next Saturday, when Mr. P. M'Nab will read a paper on the "Sales of Gas Act, 1859," and Mr. R. Halkett one on the "Heating of Water by Means of the Gas Circulator—its Fixing and Working."

Ruegg's "Employers' Liability and Workmen's Compensation."—We have received from Messrs. Butterworth and Co. the eighth edition of the above-named work. It differs from its immediate predecessor, which was published in July, 1906, in this respect—that it contains some important decisions under the Workmen's Compensation Act of that year. The price of the book, which may be noticed more fully in a subsequent issue, is 25s.

"The Electrician" Electrical Trades Directory and Handbook.—We have received from "The Electrician" Printing and Publishing Company, Limited, of Salisbury Court, Fleet Street, E.C., the above-named directory for the present year. It is the 28th edition of what is known throughout the electrical industry as the "Big Blue Book." Included in the contents are notes of the improvements made in arc and metal filament lamps, and a summary of the parliamentary work of the past session so far as it affected electrical affairs. The law of electric lighting, power, traction, &c., is dealt with; and there is a specially prepared digest by Mr. A. C. Curtis-Hayward. Full financial details as to electrical joint-stock enterprise, and information relating to the financial side of every branch of the industry are to be found, including a directory of directors of electrical companies, particulars of the capital authorized and issued, the last dividends paid, the latest Stock Exchange quotations, all the principal officials, &c.; also the principal issues of capital made last year. A graphic survey of the engineering and electrical equipment of all the electricity supply, electric power, and traction undertakings of the kingdom is given in the form of a number of compact tables, one of the largest of which is devoted to Colonial and Foreign undertakings. There are upwards of 2000 pages in the book, the contents of which have undergone thorough revision up to the time of publication. The price of the work is 15s. net, postage extra.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 758.)

THE Stock Markets, both inside the Exchange and outside in the street, have had a very busy week. The public is possessed by a spirit of speculation; and the activity and excitement are at a high pitch. A new boom was started towards the latter part of the week—South Africans *vice* Rubber and Oil resting. But concurrently with, and in spite of, all this, the leading investment markets have not done badly. The opening day was rather quiet, even in the speculative whirlpools; Consols giving way a bit, and Railways closing easier. On Tuesday, the chief markets were still inclined to be dull, and business in them was no better than quiet. Wednesday found all the Home Government issues oppressed by uneasiness in regard to the national financing; but Railways were strong and accomplished some good rises. Speculative quarters were weaker. A very fair improvement in tone and activity was apparent on Thursday. Gilt-edged were strong, and Consols rose. Railways continued cheerful and busy; and the speculative favourites revived. On Friday, the new South African boom was in full action; but the general markets were not neglected. There was steadiness in the gilt-edged division, and some advance in Railways. Saturday was quieter; but the general firmness was unimpaired, and the South African rush was still going strong. In the Money Market, the supply was ample to meet all demands for short loans on easy terms, but rates for discount stiffened steadily, and closed very firm. Business in the Gas Market was a good average bulk on the whole; but the greater part of it was in the leading issue, with a fair backing-up by the Argentine group. Changes in quotation were few, slight, and variable. In Gaslight and Coke issues, the ordinary had a good many transactions every day, and failed to maintain its position entirely. On the opening day, 104¾ was marked more than once, and this was the best price of the week; the figures giving way till one special bargain was done at 103$\frac{1}{2}$—a fall of ¼. In the secured issues, the maximum changed hands at 89 and 89½, the preference at from 103¾ to 105, and the debenture at 81¼ and 82. South Metropolitan was done several times at from 121 to 122, and once specially at 120½. The debenture realized 82¼. One transaction in the debenture at 81½ was all the business in Commercials. Among the Suburban and Provincial group, Alliance and Dublin was marked at 87½, Brentford old at 252, ditto debenture at 101¼ and 101¾, British at 45, Portsea "A" at 135, South Suburban at 121¾, and Tottenham "B" at 113¼. In the Provinces, Chester marked 110, and Liverpool "A" 223. In the Continental companies, Imperial was firmer at from 175$\frac{7}{8}$ to 177½—a rise of 1. European part-paid realized 18$\frac{3}{4}$, and Tuscan 9½ and 9$\frac{7}{16}$. Union advanced 1 in both issues. Among the undertakings of the remoter world, Buenos Ayres changed hands at 14$\frac{29}{32}$ and 15, Cape Town at 4½, Primitiva at 7$\frac{5}{8}$, ditto preference at from 5$\frac{3}{8}$ to 5$\frac{19}{32}$, ditto debenture at 99½, River Plate at from 17$\frac{7}{8}$ to 18, ditto debenture at 99¾, San Paulo at 15¾ and 16 (a fall of ¼), and ditto preference at 11$\frac{7}{8}$ and 12. Oriental rose 1; and Cape Town debenture, 3.

ELECTRICITY SUPPLY MEMORANDA.

Interesting Items from the London Companies' Meetings—Inflating Business through the Public Service—A Joint Promotion for Wiring and Fittings—Electrical Interest in the "Metropolitan" No. 2 Burner.

MOST of the London Electricity Supply Companies have now held their half-yearly or yearly meetings; and the almost uniform report at them has been that, financially, they have merely been marking time. The output of units has, generally speaking, increased; but the increase has been in the power units—the lighting units having receded through the supersession of carbon filament by metallic filament lamps. The increased revenue from power, *plus* economies in working (the lower price of coal being one), have kept the final financial position about level with 1908. Some figures given at the Charing Cross (West End and City) Company's meeting, instances how the power supply is preponderating over the lighting supply. In respect of the West-end business last year, of the increased output 50 per cent. was for power and 50 per cent. for lighting; while in respect of the City undertaking, 75 per cent. of the increase was for power, and only 25 per cent. for lighting. And according to the Chairman, the Company have only got about half way through their troubles in relation to the change-over to metallic filament lamps. From some figures compiled by the officials of the South Metropolitan Electric Light and Power Company, it would appear that, of their customers, about 75 per cent. of the shopkeepers and about 60 per cent. of the private house consumers now use metallic filament lamps, more or less. The effect in the case of this Company of the power increase over the lighting, is seen by the fact that the average price per unit received was 2·59d., as compared with 2·88d. for the previous year—a decline of about 10 per cent. This is the Company that has the wonderful "Electra" House in the Bromley Road, to show how the middle-class man's house should be "electrified" in the most extravagant manner, and beyond the ordinary man's means. It is not astonishing to learn that between 3000 and 4000 curious folks have been over the place, nor is it surprising that as yet very little direct business can be traced to the demonstration. While the Directors of the London Electric Supply Corporation do not undervalue the lighting demand, there is little doubt that they are looking forward to the power business for traction and other purposes being the backbone of their business in future. Last year 46 per cent. of the units sold by the Corporation represented the power business; and the percentage continues to move upwards in a manner showing that the low-priced units will soon be making a bigger demand on the generating plant and cables than the high-priced units, which represent the most lucrative part of the business.

In the Smithfield Markets Supply Company, we see an instance of how hardly an electricity concern is hit by the metallic filament lamp when lighting offers the only scope for business. The Company's profits from the supply of the Central Markets, as shown by the last accounts, only amount to £307; the almost universal adoption of metallic filament lamps having reduced the receipts from the sale of energy by upwards of £4000. The average revenue per lamp fell from 7s. 8d. in 1908 to 5s. 9d. in 1909. These are peculiarly interesting figures in view of the misleading statement that is so freely advertised that the adoption of the metallic filament lamp saves 75 per cent. of current. The first consequence of the loss to the Company is no dividend; the second, that the price of current to metallic filament lamp users is to be raised in order to restore happiness to the shareholders. With this increase, the Directors state that the cost of lighting will still be cheaper than gas. While sympathizing with their parlous position, we will let this piece of mendacity go by without further comment. There are two other small, but very interesting, items. The first is that Harrod's Stores now have private generating plant; and the Kensington and Knightsbridge Company are the losers of the business, which represented to them a quarter of a million units a year. The second item refers to the loss of electricity in transmission. It was mentioned by the Chairman of the Charing Cross Company that, in connection with their West-End undertaking, the loss in transmission last year was 33·1 per cent., compared with 34·1 per cent. in 1908; and in connection with the City undertaking the loss was 28·4 per cent., against 31·8 per cent. in 1908. What an amount of electricity must be lost in London during a year! We wonder if it may be assumed that a part of this finds employment in assisting the leakage of gas from the mains of the gas companies.

The electrical industry is constantly grumbling at the cloudy conditions that appear to have set in with remorseless obstinacy over it. There is one way, however, in which progress is being made by the part of the electricity industry under municipal control, over which progress the gas industry has a right to object, and that lustily. It is the action of the municipal owners of such undertakings in converting street gas-lamps to electricity for no other purpose than to inflate the business of their electricity departments. The cases of Marylebone and Hastings, and the proposals of numerous other places, rise instantly in mind. Hampstead, it is now announced, are converting a further 159 gas-lamps in Cricklewood, Kilburn, and the West-end districts; and each lantern is to be fitted with a pair of 35-watt (say 28-candle power) metallic filament lamps—that is to say, each standard will carry a light of under 60-candle power. This is stated to be the first step towards converting the whole 2237 street lamps in the borough into electric incandescent lamps. We have seen no case put forward to justify this conversion—either in respect of capital and running costs or efficiency. As a matter of fact, there is nothing to be said beyond the trite argument that municipal electricity undertakings belong to the ratepayers (and well some of them know it!). So also does the public lighting service belong to the ratepayers; and in that service they have the right to the best value for the money expended. At Leyton, too, the whole of the public lamps have been converted from gas to electricity. This has been done, out of sums taken from the ratepayers' pockets each half year, solely for the benefit of the electricity undertaking; so that it is said, with some amount of pride, no loan has been required. Of course, if we can filch from someone else the wherewithal to meet current expenses, there is no occasion to work or to borrow; but the mode of paying one's way as practised by Leyton is not a thing to boast about. The ratepayers do not know where their expenditure is going to end on this public lighting. Hastings is a shining example. For several years at this holiday resort, there has been a heavy deficit on the electricity undertaking, with the result that an increase in the price of current has been imperative; and this has put an additional annual charge of £5 per lamp on the many arc lamps in the borough. This means that every arc lamp in the borough is costing the ratepayers £5 extra—and all for the sake of the municipal electricity concern. But reverting to those twin 35-watt metallic filament lamps that are going to be fitted in the Hampstead district. In the Grove, Hammersmith, 400-candle power Osram lamps have been fixed. Reproductions of photographs of the lighting have appeared in the electrical papers. The distance from the tops of the lamp standards to the sky is much greater than from the metallic filament lamps to the surface of the road; but the sky is shown to be much better illuminated than the roadway. If the pictures truly present the condition of the Grove, then on moonless nights it is a place to be avoided. The moral of all this is the pointing of the urgent necessity for taking measures to stop the grabbing by the municipal authorities of the public lighting for the electricity concern without any care as to whether or not the ratepayers and the public service are

benefited thereby. This was a matter referred to in our editorial columns last week.

A joint effort is to be made by the Maidstone and some sixteen or seventeen other local authorities to secure (by means of a Bill) wiring and fittings powers; but much we doubt whether they will get them. It is thought that the powers can be obtained for a maximum individual contribution of £10 10s. towards the expenses. That will be cheap. But of this the promoters may be sure, that there will be severe organized opposition to the measure on the part of the electrical contractors. A similar power was last session knocked out of the measure amending the Electric Supply Acts through the pertinacity of the contractors' opposition, supported by a sympathetic House of Lords. The Canterbury Corporation are one of the authorities participating in the promotion of the Joint Bill. But after the resolution was passed supporting the measure, the consciences of some of the members pricked them, or probably the tongues of some of the local contractors had been assailing their ears; for a proposal was advanced at a subsequent meeting for the rescinding of the resolution to be part promoters. But though there were half-a-dozen members of the Council in favour of retracing steps, the remainder were not. Where the shoe pinches was seen in the remarks of the Deputy-Mayor when he said: "They as an authority were competing, in some sense on behalf of the citizens, with a powerful Company—the Gas and Water Company. In the main street, the Company had a shop showing all the latest appliances to advance their trade." That is what weighed with the majority of the Council in rejecting the rescinding resolution; but the half-a-dozen opponents of the resolution to take part in the Bill need have no fear. A stronger interest than theirs will operate against the measure.

Our electrical friends have learned that a number of Gas Companies have also a joint Bill in Parliament, but in connection with the subject of gas testing. It is interesting to find that the news has penetrated so slowly into electrical knowledge. Having got hold of the intelligence, "Meteor" in the "Electrical Times" recently commented on it, taking, of course, the point of view of the (in large part) electric supply authorities who are opposing the Bill—not so much, we opine, in the interests of the gas consumers, but because anything that tends to the slightest increase of liberty for the gas industry is against the interests of municipal electricity supply. The ignorance of "Meteor" when he writes on gas matters is the most conspicuous feature of what he has to say. It is clear that he knows little or nothing about this testing question; and so he adopts without reserve the opposition misconceptions. He tells his readers that the idea is to substitute the "Metropolitan" No. 2 test-burner for the "test-burner" now in use. Of course, it is not within his ken that there are several test-burners "at present employed," and that one of them—the one last approved by Parliament, the Board of Trade, and the Metropolitan Gas Referees—and applied to all gas undertakings, company and municipal, that have been to Parliament the last four or five years, is the "Metropolitan" No. 2 burner, which is the only recognized burner that does justice to gas of the lower illuminating power standard that Parliament now authorizes. "Meteor" apparently thinks there is some definite association between illuminating power and calorific power, because he says "the effect of this apparently trivial change will be to reduce the illuminating and calorific quality of the gas." It is not to be supposed that he has heard of gas which is only of 10 to 12 candle power that has a thermal value equal to some of our gases of 15 to 16 candle power. He also adopts the complaint of the opposition that, if the test-burner is changed, "much more gas would have to be consumed in cooking-stoves." Again, he is not aware that the hard facts of experience with consumers' accounts are against him where the "Metropolitan" test-burner is already applied. He does not know, too, that in a bunsen burner such perfect combustion cannot be obtained with gas of high illuminating power as with one of somewhat lower power, owing to the difficulty of securing thorough admixture of air with gas richly laden with illuminating hydrocarbons.

On the other hand, "Meteor" states that there is no proposal to reduce the price of gas. He need not worry himself on this score; the sliding-scale of price and dividend keeps the relations of the companies and the consumers on the right lines as to charge. Another interesting statement is that "gas has been steadily getting worse and worse." Curious, is it not, that the gas industry is not in the slightest degree perturbed? But "it has come to this, that people simply cannot use flat-flame burners, even when sick to death of the breakages, and dirt and nuisance of mantles, advertised as unbreakable." That is typical of "Meteor's" exaggeration. But it is singular, again, that the gas industry—being aware that ten times the illuminating power can be obtained from inverted incandescent burners than can be realized from an equal consumption of gas by flat-flames—are particularly anxious to exterminate all the latter burners, and to cause those burners that are supposed to sicken to death to reign supreme. Now "Meteor" do take our advice, and let the gas industry go on peaceably manufacturing a rope long and strong enough to hang itself with. When the end of the gas industry comes, see how much nicer it will be for the electricity industry. There is one point upon which we agree with "Meteor," and that has reference to chairmen of gas companies boasting that people sometimes unconsciously believe the light of the inverted incandescent gas-burner is electric light. This suggests that people think the electric light is the better one, and that the gas industry has succeeded in getting out a good deceiving imitation. At the origin of the inverted gas-lamp, the intention was not to make one having identity with the electric lamp, but to secure an actual and more useful efficiency from a pendant mantle than from an upright one. The fact that in producing lower units of the inverted form of lamp, there has been a closer approach in appearance to incandescent electric lamps is more accidental than premeditated.

OBITUARY.

Mr. JAMES BAXTER, who had been Manager of the Forfar Corporation Gas-Works since 1899, died on the 27th ult. He had been in indifferent health for a considerable time. Mr. Baxter went from Armadale to Forfar. Before that he served at Berwick and Innellan.

The death is announced, as having taken place two days after the celebration of his 70th birthday (on the 28th of February), of Herr JAKOB LINDMANN, who had for 35 years been Manager of the gas and water works at Fürth, a town of about 50,000 inhabitants, in Bavaria.

The death occurred in Vienna last Thursday, in his 66th year, of Dr. KARL LUEGER, the Burgomaster. Deceased was one of the most remarkable men in the Austrian capital, as from very humble beginnings, he became, in the language of the writer of his obituary notice in "The Times," the "founder of the Christian Socialist Party, demagogue, political 'boss,' Jew-baiter, and statesman." His name figured rather conspicuously in the "JOURNAL" some thirteen years ago, when he stirred up an agitation against the Imperial Continental Gas Association, which resulted in the establishment of municipal gas-works for Vienna, the funds for which they had some difficulty in raising. An illustrated description of these works appeared in the "JOURNAL" for the first half of 1901.

PERSONAL.

At their meeting on Thursday last, the Gas Committee of the Stockport Corporation confirmed the appointment of Mr. WALTER STANLEY SOWERBUTTS as Assistant Gas Engineer.

At St. Andrew's Church, Holborn, on the 5th inst., the marriage was solemnized of Mr. ERNEST C. PALMER, second son of Mr. C. I. Palmer, of Ipswich, and CLAUDINE PATTIE, the youngest daughter of Mr. E. D. Sapey, the Manager and Secretary of the Horsham Gas Company.

Mr. D. V. HOLLINGWORTH, F.C.S., has been appointed Chief Chemist to the Salford Gas Committee. He is a member of the Council of the Manchester and District Junior Gas Association, and has been engaged in the Gas Department of the Salford Corporation for about five years.

At the Parish Church, Hampstead, on the 26th ult., the marriage was solemnized of Mr. LAWRIE TREWBY, the Engineer and General Manager of the North Middlesex Gas Company (second son of Mr. G. C. Trewby, M.Inst.C.E., late Chief Engineer of the Gaslight and Coke Company), and EDITH CLAIRE, only daughter of Commander H. C. Wallis, R.N., of Dieppe.

The Corporation of Forfar have appointed Mr. JAMES DICKSON, the Manager of the Kelty Gas Company, as their Gas Manager, in succession to the late Mr. Baxter. Mr. Dickson is a native of Forfar. He served his apprenticeship in the Forfar Gas-Works. Afterwards he held appointments in Broughty Ferry, Burntisland, and Dunfermline, where he was foreman of the works. Three and a half years ago he was appointed Manager of the newly-formed Kelty Gas Company; and he has done excellent pioneer work there. He has been President of the Scottish Junior Gas Association—Eastern District; and for two years has been Hon. Secretary and Treasurer to that body.

A pleasant feature of the final ordinary monthly meeting of the Burslem Town Council, which took place on Monday last week, was the passing of a resolution, on the presentation of the accounts of the Gas Department for the year ended Dec. 31, 1909, expressing the Council's high appreciation of the manner in which the duties of Gas Engineer and Manager had been discharged by Mr. EDWARD JONES, M.Inst.C.E., during the four years he has filled the position. A copy of the resolution, under the seal of the Council, is to be sent to Mr. Jones. During the short discussion on the Committee's minutes, testimony was borne to Mr. Jones's able management.

German Association of Gas and Water Engineers.

A preliminary announcement is made that the fifty-first annual general meeting of the German Association of Gas and Water Engineers will take place from Monday, June 20, to Friday, June 29, at Königsberg, the capital of East Prussia. The customary reception will be held on the Monday evening; and the following three days will be devoted to the technical proceedings. On the Friday there will be an excursion. The detailed programme will be issued later. The President of the Association is Herr H. Prenger, the Manager of the Gas, Water, and Electricity Works of Cologne.

STREET ILLUMINATION IN WESTMINSTER.

Tests by the City Engineer.

We have received from the City Engineer of Westminster (Mr. J. W. Bradley, M.Inst.C.E.) the accompanying tabulated statement containing the results of his tests of gas and electric street illumination for the quarter ended Dec. 31 last, together with a statement of the comparative costs extending over a period of seven years and six months. Appended to the table are the following explanatory remarks: "In order to anticipate any objections which might arise on comparing the figures obtained for the various lamps, I have the following comments to make on the tests. All tests are carried out under precisely similar conditions. The photometer which has been used in making the observations is fitted with two, five, and ten candle standards for testing low and high power lamps respectively, and will, from its construction, give results in all cases, if anything, slightly higher than the true values by a small amount which is practically constant for all types of lamp tested—thus making the comparison of the various lamps approximately accurate. Further, precautions are duly taken during each test to guard against the effect of extraneous light, reflection from buildings, obstruction by any opaque object, such as glazing bars, and the tests are only carried out on clear

Tests of Street Lamps (Gas and Electric), with Statement of Comparative Costs Extending over a Period of 7 Years and 6 Months.

Description and Position of Lamps.	To Whom Lanterns and Columns Belong.	No. of Lamps in City, of Class Specified.	Nominal Candle Power.	Average Candle Power as Measured.	Cost of Illuminant per Lamp per Annum. (Current Contracts with the Various Companies.)	Cost of Lighting and Maintenance per Lamp per Annum. (Current Contracts with the Various Companies.)	Total Cost per Lamp per Annum. (3940 Hours.)	Total Cost per Candle Power per Hour.	Total Cost per Annum.	Total Cost per Candle Power per Annum, Last Quarter.	Average Total Cost per Candle Power per Annum, including all Tests Made during past Thirty Quarters.	Total No. of Tests up to Date.
							£ s. d.	d.	£ s. d.	d.	d.	
Charing Cross Company.												
Electric arcs, Oliver, open type double carbon (Charing Cross, West-End, and City Electricity Supply Company), opalescent globes	Columns and brackets, City Council											
Do., do., Strand, do.	Lanterns, Elec. Co.	100	1000	593	£28		30 0 0	·00308	3,000 0 0	12·14	10·36	192
Do., do., "Oriflamme," Strand, do.	Do.	21	1000	718	£27 10s.		29 10 0	·00250	619 10 0	9·86	9·86	6
Do., do., Whitehall, do.	Do.	2	2000	1355	£27 10s.		29 10 0	·00132	59 0 0	5·22	5·22	2
St. James and Pall Mall Company.	Do.	1	2000	1102	£28		30 0 0	·00165	30 0 0	6·53	6·38	37
Electric arcs, "Crompton-Pochin" (St. James and Pall Mall Electric Light Company), opalescent globes. (Minimum candle power under the contract should be 900 c.p. for each lamp.)	City Council	45	900	911	£17		19 5 0	·00128	866 5 0 (*a*)	5·07	4·92	331
Do., do., "Duplex Excello Flame," Regent Street, do. (Minimum candle power under the contract should be 1400 c.p. for each lamp.)	Do.	16	From 3000 to 4000	3575	£17		19 5 0	·00032	308 0 0	1·29	1·29	12
Do., do., "Excello" lamps, St. James's Street and St. James's Place, do. (Minimum candle power under the contract should be 900 c.p. for each lamp.)	Do.	4	From 1500 to 2000	1656	£17		19 5 0	·00070	77 0 0 (*b*)	2·78	2·78	4
Do., do., Electric arcs (various)	Do.	6	..	..	..	..	..	..	87 0 0 (*c*)	..	..	
Westminster Company.												
Electric arcs (Westminster Electric Supply Corporation), opalescent globes	Elec. Corp.	957	1000	449	£21 2 5	..	21 2 5	·00286	21,212 12 9 (*d*)	11·29	10·35	190
Electric (two) 32 c.p. lamps (do.), on refuges, Buckingham Palace Road type	Columns and brackets, City Council	143	64	..	3 17 7	..	3 17 7	..	554 14 5 (*e*)	..	..	..
Electric flame arcs (do.), Marble Arch. (Minimum candle power under the contract should be 900 c.p. for each lamp.)	City Council	5	1500	1573	14 0 0	..	14 0 0	·00054	70 0 0	2·13	2·13	5
Electric lamps (do.) various	Columns and brackets, City Council	73	..	..	..	..	..	..	190 8 4	..	..	..
Gaslight and Coke Company.												
High-pressure gas-lamps—												
Parliament Street refuges, by Parliament Square (10 cubic feet per hour)*	Lamps, complete, to City Council	2	300	284	4 5 4	3 15 0	8 15 4	·00187	17 10 8	7·40	7·40	2
Parliament Street and Whitehall refuge lamps (20 c.f.h.)*	Do.	8	600	473	£8 10 9	£4 10 0	13 15 9	·00177	110 6 0	6·99	8·27	131
Whitehall and Parliament Street (28 c.f.h.)* (Minimum candle power under the contract should be 900 c.p. for each lamp.)	Do.	18	900	985	£15 1 0		16 4 0	·00100	391 12 0	3 94	4·05	78
Aldwych and Kingsway (30 c.f.h.)* (Minimum candle power under the contract should be 700 c.p. for each lamp.)	Do.	20	700	1151	£15 1 0		16 1 0	·00084	321 0 0	3·34	4·17	525
Parliament Square (Gas Co.) (30 c.f.h.)* (Minimum candle power under the contract should be 700 c.p. for each lamp.)	Do.	5	700	995	£15 1 0		16 1 0	·00098	80 5 0	3·87	4·22	180
Three "C" incandescent gas-mantles, Victoria Street refuge lamps (11·25 c.f.h.)*	Do.	9	200	130	5 6 6	3 6 0	9 7 6	·00439	84 7 6	17·30	15·91	84
Two "C" incandescent gas-mantles, Victoria Street footway (7·5 c.f.h.)*	Do.	70	130	83	3 11 0	1 18 6	6 0 6	·00442	421 15 0	17·42	13·67	144
One "C" incandescent gas-mantle, Carlton House Terrace (3·25 c.f.h.)*	Do.	216	60	65	1 7 9	1 7 0	3 0 9	·00284	656 2 0	11·21	14·27	165
"Kern" single incandescent gas-mantles Tothill Street type (4·2 c.f.h.)*	Do.	1205	70	53	1 15 10	1 7 0	3 8 10	·00394	4,147 4 2	15·56	14·52	184
Low-pressure gas-lamps (various), practically all double mantles *plus* specials	Do.	1494	..	..	..	..	..	..	7,588 5 11	..	..	..
High-pressure do., do.	Do.	8	{600 / 900}	..	..	..	..	..	128 1 0	..	..	..
									£41,020 19 9			
Two "Osram" M.F. electric lamps, Finchley Road (borough of St. Marylebone)	..	..	150	188	..	..	4 9 6 [4000 hrs.]	·00142	..	5·71	5·71	14

* These statements of gas consumption are made by the Gas Company, and cannot be verified by this Department.

REMARKS.—(*a*) In September, 1904, the Muranese globes were replaced by opalescent; a better illumination resulting. (*b*) These lamps will shortly be altered to the Regent Street type. (*c*) These lamps are trimmed and maintained under an agreement dated Dec. 3, 1906, the rate being £2 10s. per lamp per annum; and energy for them is supplied under an agreement dated Sept. 23, 1905 (to which the last-mentioned agreement is supplemental), the rate of charge being 2·5d. per unit. (*d*) Many of the lamps tested during the quarter were of very poor candle power. (*e*) Lamps were too poor to read for testing purposes. Globes to lanterns very dirty.

nights. In the case of incandescent mantles, including ordinary and high-pressure lamps, great variations in candle power are found to be due to the condition of the mantles. What appears to the naked eye as only a slight diminution in intensity resulting practically in an enormous loss of candle power. In the case of lanterns with groups of incandescent mantles, it is found that such mantles are difficult to keep in good order; and the effective candle power does not increase in the same ratio as the number of mantles. It has been repeatedly found that a slight defect in any one of the incandescent mantles in high-pressure lamps causes a great loss of candle power; and this circumstance renders it difficult to form any comparison between tests carried out in a laboratory and those made under actual lighting conditions, as in the cases given above."

THE "PAX" PATENTS.

Electrical Ignition—Light in any Position—New Petrol Gas System.

THERE are men of many parts; and Mr. P. Curral Pace appears to be one of them. He is an inventor; and he has been turning his attention to gas-lighting in more than one direction. At the office of the Pax Patents Company, of Durham House, John Street, Adelphi, examples of his ingenuity are to be seen. From our point of view, the most attractive is the "Pax" switch for electrically lighting and extinguishing gas. The system has remarkable adaptability and elasticity. A little pressure that is almost unconsciously given when turning a gas tap at the entrance, or in any other part, of a room simultaneously establishes electrical contact, sets the igniter at work, and opens the gas-way to the burner. It is simplicity itself. The combined switch and tap are situated on the inlet-pipe to the lights in a room. Two discs (through the centre of which runs the gas-tap) form the electric switch. The discs are kept apart by a small spring; but on their inner faces metallic rings are fixed; so that, when pressed together, they make contact, and the electrical circuit is established. Only one wire is carried round a room. A small coil and three batteries will suffice for "hundreds" of lights, and it is understood will last a considerable period, seeing that there is only a small momentary demand on them at any time. The electrical ignition spark (special platinized points are used) is fixed just outside the mantles of the burners; so that it is not subject to the direct influence of the heat of the gas-flame. The invention, tried by a representative of the "JOURNAL," fully answered all the demands made upon it. It can be applied to any number of lights, can be arranged so that any number can be operated at one time, and can be installed so as to be operated from any distance. Means of lighting and extinguishing can be provided at any one or more convenient points on the lighting system of a room, hall, factory, church, or other place. And there can also be application just as easily to gas-fires, cooking-stoves, water-heaters, &c. Street lighting is not beyond its province; and it is suggested that an installation of the system will quickly repay its cost by the economy effected by doing away with the bye-pass and by the saving of mantles, the life of which is not prolonged by the careless use of the lamplighter's torch. The inventor does not propose, though it can be accomplished, to do away with the lamplighter himself. He contemplates fitting the arrangement to street lamps, and to provide a little plug-hole in the lamp standard. The lamplighter will carry a small coil and battery in a satchell; and all he will have to do will be to put in the plug, and the lamp will be lighted. Of course, by the continuous wiring of the lamps, they can be ignited and extinguished from one centre.

A second invention is an angle bracket light with reflector for use with a special inverted gas-burner; one of the features of the latter being the patent locking arrangement for the mantle, which maintains it rigidly fixed to the burner nozzle no matter at what angle the bracket is placed. The convenience of such a bracket is that the full power of the light can be directed at will on to any object in any position, without injury to the mantle. The arrangement should be particularly applicable to shop window lighting, exhibits, and so forth.

Mr. Pace is also proposing by his "Pharoso" system of lighting and heating by petrol gas that every house shall have its own gas manufactory on the small scale; although he recognizes that the main field in which his system must make appeal is among those habitations, factories, mills, and other places that are remote from distributing-mains, carrying a cheap gas supply. The new system differs entirely from the ordinary petrol air-gas ones. There is the petrol container, from which petrol is driven through a fine flexible tube to a small vaporizer situated in any convenient position in the house or other building to be lighted. The vaporizer is a very small thing, and consists of an arched-shaped casing on a stand. Through this (connected up at one end with the petrol supply-pipe) runs the vaporizing-tube, which is about the size of an ordinary lead pencil. The petrol vapour passes through fine perforations in a cap at the other end of the tube, out through an injector, into a ⅜-inch brass tube connected up to the house gas-service. Between the injector and the inlet to the brass tube, there is an air space; and it is here that the petrol vapour sucks in the necessary amount of air. By varying the distance between the injector and the inlet-tube, the quality of the mixture is determined. The vaporizer is started by a small tray of methylated spirit; and is afterwards kept going by bye-passing to the bottom of the vaporizer a small amount of the petrol gas from the neighbouring service-pipe. The capacity of the vaporizer is varied by adding fresh vaporizing-tubes. The quantity of gas made, if it exceeds requirements, can be diminished by reducing the size of the nipple; and if any surplus gas is made, it can be stored. The gas has also been tried with, it is reported, good results, for cooking and heating. With regard to lighting, any incandescent burner can be employed. Those seen in use were the bijou "Nico" inverted with the primary air-supply reduced very low. The mantles were fully incandescent; and the light was good. The inventor has not yet made any positive tests of consumption or photometrical value; and therefore it must be taken as within the region of conjecture, or rather of computation only, that a light equal to 100-candle power can be procured for ten hours for 1½d., with petrol at 1s. 2d. per gallon. Among other claims are that the gas is non-explosive, and that there is no condensation trouble from it if the mixture is properly adjusted.

DIRECT SULPHATE OF AMMONIA MANUFACTURE.

NOTES OF SOME EXPERIMENTS AND THEORIES.

II.

By G. STANLEY COOPER, B.Sc.

IN a previous article on this subject (*ante*, p. 496), the manufacture of sulphate from crude coal gas was considered. In this communication, the manufacture through ammonium sulphite is discussed; and further experimental work on another direct process is also submitted. It has been proposed to manufacture sulphate of ammonia by first obtaining sulphur dioxide, passing this gas into ammonia, and oxidizing the ammonium sulphite so formed to ammonium sulphate. If sulphur dioxide is passed into water, a solution of sulphurous acid is obtained which, on long standing, changes by atmospheric oxidation into sulphuric acid. If a process could be established for bringing about this oxidation cheaply and quickly, it would soon become a general method for the manufacture of sulphuric acid. But unfortunately up to the present no such process has been discovered.

If we substitute ammonia for water in the above, a similar reaction goes on. The ammonia is first converted into ammonium sulphite, and this, by further oxidation, changes to ammonium sulphate. Here, again, the process is a slow one, and the difficulty is the oxidation. The reactions involved are represented by the following equations:—

$$2NH_3 + SO_2 + H_2O = (NH_4)_2SO_3$$
$$(NH_4)_2SO_3 + O = (NH_4)_2SO_4$$

If insufficient ammonia is present, the acid salt is formed instead of the neutral salt required. Thus—

$$NH_3 + SO_2 + H_2O = NH_4\,HSO_3$$

Since sulphur is present in some form or other in all crude coal gas, the production of the sulphur dioxide required is an easy matter. Both free sulphur and sulphuretted hydrogen yield sulphur dioxide on oxidation. Thus—

$$S + O_2 = SO_2$$
$$H_2S + 3O = H_2O + SO_2$$

Hence a process might be devised by which the sulphuretted hydrogen present in coal gas could be converted into sulphur dioxide by oxidation, and the resulting gas led into ammonia. If this could be carried out satisfactorily, it would do away with the necessity for oxide purifiers. Sulphuretted hydrogen is most readily oxidized to sulphur dioxide by burning; but this application is, of course, impossible. In any oxidation process, too, the supply of oxygen would have to be carefully regulated, and only the requisite amount for complete oxidation admitted. Excess of oxygen would act as a diluent on the gas; while a shortage of oxygen would leave the gas still contaminated with sulphur.

Another method which could be used for the production of sulphur dioxide is by burning the free sulphur contained in the spent oxide, and also by burning the spent oxide itself. This latter consists chiefly of sulphides of iron, FeS and Fe_2S_3, both of which on burning yield sulphur dioxide. Thus—

$$2FeS + 7O = Fe_2O_3 + 2SO_2$$
$$Fe_2S_3 + 9O = Fe_2O_3 + 3SO_2$$

The sulphur dioxide so obtained can be dealt with in two ways. In the first process, it might be passed directly into the ammonia, and so form ammonium sulphite; or, secondly, it could be passed into the coal gas after leaving the scrubber, and the mixture then passed into a solution of ammonia. The sulphur dioxide would be taken out, and the coal gas left purified. An extra washing would be necessary so as to eliminate any ammonia carried over with the gas. In this process, too—assuming that "theory" would work completely in practice—no oxide purifiers would be required. The sulphur dioxide passed in would purify the gas from sulphuretted hydrogen; for these two gases react with each other with production of free sulphur. This sulphur would be deposited in the flues or mixing-chambers, and could be collected and burned to give more sulphur dioxide. The reaction which takes place is represented by the following equation:

$$2H_2S + SO_2 = 3S + 2H_2O.$$

Excess of sulphur dioxide would, of course, be present, and would be carried on into the ammonia.

Sulphur dioxide is a bleaching gas in presence of water, and

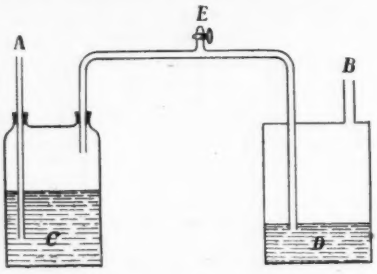
forms sulphuric acid during the process. It can also be oxidized to sulphuric acid by means of iodic acid, HIO_3. Thus—

$$2HIO_3 + 4H_2O + 5SO_2 = 5H_2SO_4 + I_2.$$

Neither of these processes, however, is likely to find application on a commercial scale.

The second direct process referred to above, and one which has been worked successfully on a small scale, depends on a property of all gases—viz., that one gas acts as a vacuum to another gas. If, for example, we had a jar full of hydrogen, and it was exposed to the air, the hydrogen would escape into the air whatever the relative pressures of the gases might be. Similarly, if a current of air is passed through a solution of ammonia in water, the air will displace most of the ammonia from the solution. It is difficult to get rid of all trace of ammonia by this method; but a very large percentage can be so evolved. This principle is also applied in the case of persons who have been "gassed" with poisonous gases, such as coal gas, &c. A stream of oxygen is forced through the lungs, and this displaces the poisonous gas, and renews the circulation.

From the experiments described in the previous article, it was found that the presence of sulphuretted hydrogen had a deleterious effect on any direct process, and that this gas ought to be eliminated. This practically means that the crude coal gas must be purified from sulphuretted hydrogen in the ordinary way—viz., by passing through the oxide purifiers. Before going through the oxide purifier, however, it is necessary to remove all the tar from the gas, as the deposition of this would spoil the oxide. But the removal of the tar by condensation necessitates the removal also of most of the ammonia in the form of ammoniacal liquor; and the gas remaining is almost ammonia free. For the direct process, this gas must be recharged with ammonia; and this was done by applying the principle above referred to.

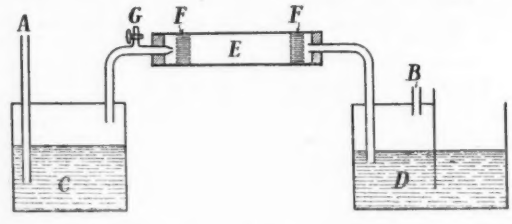


A. Gas Inlet. B. Gas Outlet. C. Ammonia. D. Sulphuric Acid. E. Bye-Pass Tap for Testing Gas for Ammonia.

Laboratory Apparatus.

The process was tried first on a laboratory scale as follows. A two-necked Woulff's bottle, with the attendant delivery tubes, and a porcelain jar, were the only pieces of apparatus necessary. The bottle was almost filled with a solution of ammonia of specific gravity ·9, equivalent to about 28·3 per cent. by weight of ammonia; while in the jar was placed sulphuric acid of specific gravity 1·67, corresponding to 74·51 per cent. by weight of acid and 134° Twaddel. It was found that the best results were obtained, as far as the production of solid sulphate was concerned, by using acid of about this strength. A slow stream of gas was passed through the ammonia from an ordinary laboratory service-pipe, and then into the acid. This was allowed to pass for some hours, and the ammonia twice renewed. The sulphuric acid was completely neutralized; and a beautiful specimen of sulphate of ammonia was obtained. Of course, it must be remembered that the conditions here were ideal, and were such as would not obtain on a gas-works scale. Still, the results were sufficiently encouraging to point to the possibility of a process based on this principle. The ammonia was completely absorbed by the acid, provided the gas stream was not allowed to pass too quickly. Nessler's reagent was used for testing for the ammonia; and no coloration at all was given by the gas issuing from the acid chamber, provided the rate of flow of the gas was sufficiently slow. Analysis of the resulting sulphate by independent workers showed a practically pure salt.

The process was tried on a larger scale on the gas-works, using ammoniacal liquor and commercial sulphuric acid. The strength of the former was not tested; but the acid was of about the same strength as that used in the first experiment—*i.e.*, 134° Twaddel. The liquor was light brown in colour, and contained tar, &c., in suspension, and some sulphuretted hydrogen in solution. It was found that a small quantity of tarry matter was carried over on passing a stream of coal gas through the liquor. To prevent this being carried forward into the acid, a filter tube similar to the one described in the previous article was interpolated between the vessel containing the ammonia and the one containing the acid. The arrangement of the apparatus used is shown in the following sketch. It consisted of an iron vessel to contain the ammonia, fitted with an inlet-tube dipping well into the liquid, and an outlet-tube which was quite clear of the liquid. The outlet-tube was provided with a bye-pass, so that the gas could be tested for ammonia, and so that it could be easily seen when the liquor required changing. The outlet-tube was then connected with a long filter-tube packed with coke,



A. Gas Inlet. B. Gas Outlet. C. Ammoniacal Liquor. D. Sulphuric Acid. E. Filter Chamber to Remove Tar. F. Plugs of Lime to Remove Sulphuretted Hydrogen. G. Tap for Testing Gas for Ammonia.

Works Apparatus.

&c., to remove any tar; and a loose plug of lime was placed at each end to absorb any sulphuretted hydrogen which might be present. If present at all, it would only be so in very minute quantities, so that the cost of lime purification would be almost negligible, even on a large scale. From the filter, the gas was led into a partitioned chamber, as shown, containing the acid.

This form of saturator was used so that the acid could be renewed, and the solid sulphate removed, without discontinuing the process. The acid used was previously tested for arsenic, as this substance affects the quality of the sulphate produced. No arsenic was, however, found in the acid. The apparatus was connected with a side gas-outlet immediately after the gas had left the last purifier. The gas passed through the ammoniacal liquor, and became charged with ammonia. It was then led through a small pressure tube, and into the filter. A very small amount of tar was deposited at the entrance end of the filter-chamber; and slight traces of sulphuretted hydrogen were detected on testing the gas at the side tube. A slow stream of ammoniacal coal gas was passed through the sulphuric acid for some time; and eventually some solid sulphate was produced. The acid was slightly discoloured, probably owing to imperfect filtration of the gas; and the resulting sulphate was not quite pure. A second experiment with more efficient filtration yielded a much better sample of sulphate.

By using the form of saturator shown, the solid sulphate can be removed as it is formed, and dried in the usual way in a centrifugal machine. The potentialities of this process are evident, as, if it could be worked successfully on a larger scale—and there seems no obvious reason why it should not—a good deal of expensive apparatus in sulphate manufacture would be done away with. No heating is required to drive off the ammonia from solution. Further experiments will be necessary to decide what is the best working strength of liquor to be used. Though all the ammonia is not displaced from the liquor, yet the loss need be very small indeed. It would be quite feasible to syphon the liquor from the washer, hydraulic main, or settling tank into the vessel C, and, when most of the ammonia had been evolved, to re-fill the washer with this used liquor.

During the experiments, the temperature of the vessel containing the ammoniacal liquor fell from 12° C. to 1° C., owing to some amount of evaporation. The temperature of the saturator, however, rose considerably, owing to the evolution of heat during the process of neutralization. The progressive dilution of the acid by the water vapour carried over with the gas from the liquor may have some effect on the production of solid sulphate when the experiments are carried out on a larger scale. In this case, however, very little (if any) such interference was noticed; and so it was not investigated. The sulphuric acid would thoroughly free the gas from moisture, and this should increase the net calorific value of the gas.

At the students' meeting held at the Institution of Civil Engineers on the 4th inst., Mr. A. J. Hart read a paper entitled "Reinforced Concrete as Applied to Retaining Walls, Reservoirs, and Dams." The author discussed generally the methods employed in the erection of reinforced concrete structures, and the principles governing their design, and dwelt on the economy of reinforced over mass concrete construction. The paper was illustrated by a number of diagrams and several lantern slides. A well-sustained discussion followed.

A recent number of the "Zeitschrift für physikalische Chemie" contained a paper, by Mr. J. T. Barker, on the determination of the vapour pressures of toluene, naphthalene, and benzene at temperatures ranging from − 78° C. to 25·8° C. According to an abstract in "Nature," at the lower temperatures the statical method is not sufficiently exact, and hence the vapour pressures were measured by saturating pure oxygen, prepared electrolytically, with the vapour of the substance; the latter being maintained at a constant temperature. The amount of vapour carried away by the oxygen was determined by combustion; full details being given of the precautions necessary for exact working. The method was shown to be capable of measuring vapour pressures down to 0·005 mm. of mercury. The experimental results were compared with Nernst's formula for the calculation of vapour-pressure curves, and for toluene, naphthalene, and benzene; and the agreement was found to be quite satisfactory.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS & MANAGERS.

The Annual Meeting of the Association was held last Thursday, at the Hotel Cecil, W.C. There was a large attendance of members; among them being the President of the Institution of Gas Engineers (Mr. James W. Helps, of Croydon). At the opening of the proceedings, the retiring PRESIDENT (Mr. James Paterson, of Redhill) occupied the chair.

In the first place, the minutes of the last meeting were taken as read, and confirmed.

REPORT OF THE COMMITTEE.

Mr. R. BEYNON (Torquay) proposed the adoption of the annual report of the Committee; and, in doing so, he thanked them for the full statement they had made.

Mr. C. F. BOTLEY (Hastings) seconded the motion; and it was unanimously agreed to.

The report reviewed the proceedings of the year. In referring to the autumn meeting, the following allusion was made to the retirement of Mr. A. F. Browne from the office of Hon. Secretary and Treasurer:

The Committee had previously endeavoured to persuade Mr. A. F. Browne (Vauxhall) to continue in office as Hon. Secretary and Treasurer (and it will be remembered that only by the urgent request of the Association was he deterred from relinquishing these offices before), but without success, as he did not see his way to continue any longer. The Committee wish to acknowledge most heartily Mr. Browne's valuable services to the Association, extending over a period of four years, and to which are due in no small measure the continued prosperity of the Association. They feel that his resignation is a real loss to the members; but they are glad to be able to record that he consented to serve on the Committee. A very sincere vote of thanks was passed to Mr. Browne for his arduous and untiring energy in the interests of the Association. Mr. James Paterson was elected to the vacant offices; and the Association may be congratulated on the acceptance of these posts by one who is so well fitted for them.

The final paragraphs of the report were:

Since the issue of the last list, three names have been added to the roll of membership, four members have resigned, two have become disqualified, and three—viz., Messrs. W. A. Valon, J. Meiklejohn, and J. Nicholls—have passed away; leaving a total of 165, as compared with 171.

The balance standing to the credit of the Association at the beginning of the year was £95 8s. The receipts amounted to £85 11s. 6d., and the expenditure to £125 8s. 7d. (inclusive of £42 subscribed to the Sir George Livesey Memorial Fund); leaving a balance of £55 10s. 11d. to carry forward. The usual copies of the "Reports of Gas Associations" were presented to members, absorbing a sum of £41.

The attendance at, and interest shown in, the meetings of the Association have been fully maintained; and the Committee feel that the year has been one in which the Association has afforded real help to members in the dissemination of practical and technical knowledge under pleasant and congenial circumstances. For this, sincere thanks are due to the President, who has promoted the interests of the Association with all his ability and energy; to Mr. A. F. Browne, until recently the Hon. Secretary and Treasurer; and also to those who, by giving time and thought to the preparation of papers, or by leading discussion, have contributed so materially to the pleasure and enjoyment of the members.

The Commercial Section of the Association was started in October under the direction of Mr. W. E. Price, of Hampton Wick, as Chairman, and a representative Committee. Fortnightly residuals returns are made by the members and circulated in due course by the Hon. Secretary. General meetings have been held, at which discussions of matters of commercial interest have been found of great use by the members. The total number of gas undertakings on the register is 46.

NEW MEMBERS.

Mr. P. P. CHANNON (Haywards Heath) moved, and Mr. R. S. TOBEY (Horley) seconded, the adoption of the following nominations for membership: Mr. W. J. Carpenter, of Great Yarmouth; Mr. R. H. Collins, of Eltham; Mr. D. C. Cross, of Leyton; Mr. Joseph Fisher, of Tottenham; Mr. F. W. Taylor, of Harpenden; and Mr. A. E. Williams, of Poplar.

THE NEW AND RETIRING PRESIDENTS.

The PRESIDENT said he now came to the last duty he had to perform as President. It was a very pleasant one indeed. It was pleasant to him because he was releasing himself from the cares of the office; and, pleasant as it had been, he was glad to think that a gentleman so well qualified as Mr. Ellery was taking it. His name needed no recommendation from him (Mr. Paterson), as it was known far and wide throughout the country, if not further. He was sure the interests of the Association would not suffer in the slightest degree at Mr. Ellery's hands, and that it would prosper well beyond its present state.

Mr. C. STAFFORD ELLERY (Bath) then took the chair; being enthusiastically received by the members.

The PRESIDENT remarked that his first pleasant duty was to propose a vote of thanks to the retiring President. It seemed to him that the word "retiring" should be transposed into "untiring." He (Mr. Ellery) was interested in the word, because he was looking forward to the day when he should be the retiring President. He could understand that, in putting off the burden of office, there was a certain sense of relief. But Mr. Paterson, as an "untiring" President, seemed to have passed through his year of office without much personal harm. He (the President) hoped he should similarly survive. They were indebted to Mr. Paterson not less for what he had done for the Commercial Section. It did not, however, need any words from him to emphasize the fact that it was a useful movement inaugurated he believed by Mr. Paterson himself in connection with the Association. They had therefore to thank him not only for his services in the chair, but for his services in connection with the Commercial Section.

Mr. C. F. FRANKS (Bankside), in seconding the proposition, said Mr. Paterson had fulfilled their expectations when he was elected to the chair. He had indeed most worthily upheld the traditions of his name.

The proposition was heartily agreed to.

Mr. PATERSON, in reply, asked the members to accept his hearty and sincere thanks for the vote. He could assure the members that nothing could be more pleasurable than to hold office as the President of the Association. Though he entered upon the position with many misgivings a year ago, little knowing what was in front of him, yet he knew he had with him a splendid, energetic Committee and an excellent Hon. Secretary in Mr. Browne. They constituted what he might call the permanent staff of the Association; and he could tell the members "in the strictest confidence," but with the fullest assurance, that no President would attempt to carry through a year of office without this permanent staff. In them, the new President would find his greatest stronghold in carrying out his duties. The President had made kindly remarks with reference to the Commercial Section. This had been a work of pure pleasure and love to him (Mr. Paterson). Whatever had been done by him had been with the greatest amount of pleasure. He felt that when one threw his energies into any movement—whether it was a new movement or the carrying on of an old one—the greatest reward one could have was the knowledge that it had been of some use to those who had been connected with it. He thanked the members from the bottom of his heart for the kind way in which they had passed the vote of thanks, and for the manner in which they had supported him throughout the year.

VISIT TO BATH.

The HON. SECRETARY (Mr. Paterson) said he rose again in quite a different capacity. At the last meeting, the members did him the honour of electing him as Hon. Secretary and Treasurer; and he believed from this moment he had to take over the office. His first duty as Secretary was to inform the members that the President had that afternoon conveyed to the Committee a cordial invitation to the Association from his Chairman and Directors to pay a visit to Bath for the May meeting. He (the Hon. Secretary) was sure they would all enjoy the visit to Bath; and that they, one and all, would be looking forward with pleasure to seeing their President in his works. [Applause.]

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—To be quite candid, I must confess that, while appreciating very highly the honour of being elected President of this important Association, the task of preparing an address worthy of the occasion fills me with a gloomy foreboding. In these days of constant advance, I cannot help thinking it would be wise to select younger men, with more leisure than some of us can find to devote to the interests of the Association. Your kindness, however, having placed me here, I ask your indulgence while attempting to touch upon a few subjects which appear to me to be of practical interest at the present moment.

The report of the Committee deals with various points of interest to which I need not now add any remarks, except to refer to the loss we have sustained by the death of three members: Mr. W. A. Valon, Mr. J. Nicholls, of Crewkerne, and Mr. John Meiklejohn, of Yorktown. Some of us who have had the pleasure of knowing Mr. Valon for many years past still think of him as "Valon of Ramsgate." It was at Ramsgate he made his mark; and at Ramsgate he was always ready to extend a hearty welcome to visitors, who never left without some food for reflection in what they had seen or heard. He was President of this Association in 1883, having become a member in February 1876; and although not actively associated with us of late years, yet he will be long remembered and much missed in the various spheres of professional work in which he has been engaged since leaving Ramsgate. I feel sure I do but express the feelings of all the members of this Association when I say that our sincere sympathy goes out to the members of the families of each of the deceased gentlemen.

ORGANIZATION AND INDEBTEDNESS.

In trying to arrange my ideas on paper, two questions were present in my mind: (1) What are the objects on which these Associations were originally based? and (2) is the need for such Associations as great to-day as when they were first founded? A most cursory glance over the records and experiences of the past year, soon proved conclusively that more than ever in the history of the gas industry it is necessary to find opportunities for inter-

change of ideas on the many and varied items that go to make up the routine of our profession. I am glad of this opportunity to express my indebtedness to writers of papers, and to other members, for much information which has been of the greatest use to me personally, and of very considerable benefit to the Company I serve.

In this connection, I also wish to place on record an expression of appreciation of the service rendered to the industry by the Technical Press. Never before have we been furnished with such a mass of matter meriting careful study. The difficulty is to find time for reading, even in the most cursory manner, all that is so admirably written. If any of the following remarks should appear to be a mere repetition of what has been already better said, I can only plead for pity, and say that, in my opinion, it would add much to the interest and usefulness of these occasions if the Presidential Address was open to merciful discussion; and, if not out of order, I would cordially welcome such discussion to-day.

RAPID MARCH OF INVENTION.

The rapid march of invention and discovery in recent years is almost bewildering. Take the retort-house as an illustration. The engineer who has just now to undertake the construction or reconstruction of carbonizing plant is faced by most embarrassing problems. Is the gas to be produced from coal or oil? If coal, what is to be the shape and size of the retorts or chambers; should they be built horizontally or vertically, or at some angle between these two extremes; should they be machine or hand made, or constructed of bricks, or built-up in segments? Of scarcely less importance is the selection of the most suitable and economical means of mechanically handling the coal and coke, and fixing the point at which to fall back on manual labour.

One of the healthiest signs of the times is to be found in the enterprise of those who are striking out on entirely new lines, and putting down installations of vertical retorts and other modern plant. Our "Transactions" have been greatly enriched already by the record of what has been done; and we look for further valuable information in the near future. But while sweeping changes are being made in some works—both at home and on the Continent—it is gratifying to know that steady advance in carbonizing results is also taking place in works still using what may be styled old-fashioned plant. This increased efficiency—achieved by obtaining a larger output from existing retort-houses—spells reduced capital charges per 1000 cubic feet of gas sold.

In Bath, the reduction in the amount required to pay interest and dividends on the capital expended, as compared with twelve years ago, amounts to rather more than 2d. per 1000 cubic feet of gas sold. The wisdom of keeping down capital expenditure, and regularly wiping off sufficient sums for depreciation, cannot be too insistently urged—not only in the manufacturing department, but perhaps more so still in connection with stoves, meters, and slot installations.

COKE-CONVEYING COSTS.

While upon the question of retort-house economies, it may not be without interest to give some figures which have recently been taken out of the comparative cost of working two different types of coke-conveyors in Bath. The figures cover a period of four years—a single year does not give a fair average, as renewals vary so considerably from year to year. The machinery is driven in each case by gas-engines, and conveys the coke from the retorts to the storage yard or overhead hoppers as required. The figures include the cost of power, labour, maintenance, and renewals.

	Quantity Coke Conveyed.	Cost per Ton of Coke Conveyed.	Gas Used per Ton of Coke Conveyed.	
Plant A	84,239 tons	4·1d.	38·4 cub. ft.	Gas charged 2s. per 1000 cub. ft.
Plant B	50,816 ,,	5·4d.	52·0 ,,	No charge for water.

The interest on capital outlay may be taken at about 2d. per ton in the case of Plant A, and about 2½d. per ton in the case of Plant B. In the second case, a cross conveyor accounts for some part of the extra cost. In making comparisons with hand labour, it should be borne in mind that by the use of hoppers, considerable economy is secured in loading carts and railway waggons; but, on the other hand, the quantity of breeze produced is increased.

TAR-SEAL RESTORED.

Before passing from the retort-house, some remarks on the hydraulic main may not be out of place. Much has been written—both for and against this part of the plant; and yet it still remains, and seems likely to outlast, every attack and criticism.

It will probably come as a surprise to some present to hear any words in favour of reverting to a tar-seal; but many years of close and continuous observations have brought me back to this method of working. It would be a long and perhaps tedious tale to give details of the stages passed through before arriving at this conclusion. In a word, after working with tar-seals, and experimenting on a large scale for some years with anti-dips and later with liquor seals, the results appeared to prove: First, that some sort of seal was desirable, whether considering the effect on the tar, the retorts, or the gas made; and, secondly, that tar was the most suitable material with which to form a seal. Having decided to abandon anti-dips, numerous expedients were tried in attempts to maintain a liquor seal and keep the main free from tar. I should perhaps add that registers were fixed at various points to record continuously the actual working conditions in the retorts and mains.

Shortly after the tar had been withdrawn from the hydraulic main and the weir-valves set to as fine a seal as was considered desirable, the unexpected happened. Rising pressures in various parts of the works indicated a rapid and very considerable increase in the quantity of naphthalene in the gas; and it soon became necessary to allow tar to again accumulate in the hydraulic main. It may also be mentioned that, during the continuance of liquor seals, it was observed that the ascension pipes gave increased trouble to the men using the auger, and, what was perhaps of still more importance, the hot gases passing from the retorts showed a marked tendency at times to evaporate the liquor at a greater rate than it was being made, lowering the seals somewhat inconveniently, and requiring, at times, the addition of fresh water or liquor. While recognizing the advantages attending the use of water-seals and their extensive adoption in many works, we determined to try the effect of sealing the dip-pipes with the liquid products as made—the seals being regulated by adjustable weir-valves, over which the surplus tar and liquor flowed to the tar-main.

During the time these experiments were proceeding, the tar was closely observed, and it was discovered that a judicious admission of steam into the tar-mains was attended by most satisfactory results—the tendency to thicken being lessened, and the condition of the tar-mains improved. Steam-pipes were consequently connected to the underside of the hydraulic main and to the tar draw-off pipes, and steam admitted in quantities varingy according to the temperature of the atmosphere. This sufficed to maintain the tar in a very fluid condition, and the gas in its passage from the dip-pipes agitates the contents of the hydraulic main so thoroughly that no trouble is experienced with thick tar or stopped tar-mains. Careful attention is necessary, and the valves fitted to connections from the syphons on the underside of the hydraulic main, are regularly opened to test the consistency of the tar, and prevent the accumulation of any sediment. Working under these conditions, the registers indicate a regular seal with a minimum pressure in the retorts, and a choked pipe is a rarity.

But the main point in this reference to the hydraulic main, is the effect of a tar-seal on the naphthalene contents of the gas. It is interesting to note that the tar when drawn off from the hydraulic main, while steam is being admitted has a temperature of about 184° Fahr., and contains about 5½ per cent. of naphthalene, and without steam the temperature is about 138° Fahr., with about the same percentage of naphthalene. Although the steamed tar from the overflow becomes viscid when exposed to the atmosphere, no trouble is experienced in the mains, which is doubtless due to the fact that it becomes mixed with the lighter tars in its passage to the well, before the temperature is reduced.

SEEKING FOR A NAPHTHALENE SOLVENT.

The experience thus gained appeared to indicate the direction in which to look for a cure for the naphthalene plague, and confirms the ideas of some members of this Association and others who have been working out the problem of solvents elsewhere. In seeking to ascertain the most effective and economical solvent for naphthalene, a number of laboratory tests were carried out by my assistant, Mr. Bingley, to whom I am indebted for much help in these investigations. The following figures are given in the hope that they may be of some service.

A known quantity of each was distilled, and 10 per cent. fractions were taken off at the temperatures noted, with the exception of petrol and benzol, which it will be seen were treated somewhat differently. Some of the samples tested were found to contain a certain quantity of naphthalene when received from the makers. It would be difficult to enumerate the "cures" tried during the many years we have been contending with this enemy, but temporary relief was found by injecting one or other of these oils, by means of live steam, at various points on the works' mains.

Name of Oil.	Saturated at 52° Fahr. (room Temp.) Naphthalene dissolved.	Specific Gravity.	Grains Naphthalene Dissolved at 52° Fahr. by 1 Gallon.	Grains Dissolved at Cost of 1d.
	Per Cent.			
Rocklight	8·7	·8247	5507	1159
Royal Standard	9·23	·8117	5784	1220
Kerosene	9·1	·810	5687	928
Scotch oil	11·3	·7685	6886	1148
Royal daylight	9·20	·8017	5690	1084
Crown diamond	7·78	·8158	4820	988
Benzol (commercial)	24·9	·8827	20513	2413
Petrol (or motor spirit)	10·18	·709	5628	625
Heavy naphtha (commercial, refined)	13·5	·925	10133	921
Tar oil	9·74	·9027	6824	682
Creosote oil	3·15	·9693	2211	340
American gas oil	5·89	·8606	3771	1371
Oil gas tar	23·5	1·035	19760	1606

OIL-GAS TAR PREFERRED.

The publication of the report of the Naphthalene Investigation Committee, and the helpful remarks of Dr. Colman, led later to the systematic use of oil-gas tar, maintained at a temperature of

Results of Distillation.

Fraction.	Rocklight Oil.	Royal Standard.	Kerosene.	Solvine Scotch Oil.	Royal Daylight.	Crown Diamond.	Petrol or Motor Spirit.		Commercial Benzol.		Heavy Naphtha (Refined).	Tar Oil.	Creosote Oil.	American Gas Oil.
1	266–320° F.	284–356° F.	220–290° F.	220–280° F.	230–297° F.	230–298° F.	90–212° F.	325 c/cs. = 81·25 %	Up to 212° F.	295 c/c = 74·0 %	248–311° F.	248–286° F.	266–356° F.	230–500° F.
2	320–349	356–374	290–310	280–302	297–340	298–347	212–234	40 = 10·0	212–234	40 = 10·0	311–320	286–304	356–379	500–538
3	349–370	374–397	310–320	302–310	340–365	347–388	234–293	30 = 7·5	234–288	40 = 10·0	320–331	304–320	379–396	538–563
4	370–378	397–413	320–332	310–322	365–386	388–430	Difference	5 = 1·25	288–383	16 = 4·0	331–336	320–339	396–408	563–595
5	378–387	413–433	332–342	322–330	386–396	430–471		400 = 100·0	Solid Naphthalene Difference	*4 } 5 } 2·0	336–340	329–334	408–421	595–608
6	387–406	433–446	342–358	330–340	396–450	471–500					340–345	334–343	*421–433	608–630
7	406–417	446–473	358–390	340–348	450–486	500–523				400 = 100·0	345–349	343–352	*433–446	630–646
8	417–430	473–487	390–422	348–360	486–523	523–545					349–358	352–363	*446–462	646–669
9	430–482	487–545	422–464	360–380	523–572	545–590					358–370	363–379	462–484	669–680
10	482–572	545–698	464–560	380–410	572–626	590–626					*370–406	*379–397	484–536	680–689
										*containing 1 % Naphthalene. 5 c/cs.	*containing 4·6 % Naph.	*containing 6·3 % Naph.	*containing 5·6 % Naph.	
Loss and difference	5 c/cs.	10 c/cs.	2 c/cs.	2 c/cs.	5 c/cs.	6 c/cs.		5 c/cs.			2 c/cs.	7 c/cs.	7 c/cs.	8 c/cs.
Specific gravity	·8247	·8117	·810	·7685	·8017	·8158	·7091		·8827		·925	·9027	·9693	·8606
Flash point	77° Fahr.	74° Fahr.	79° Fahr.	98° Fahr.	80° Fahr.	79° Fahr.	Under 59° Fahr. (temp. of room).		Under 58° Fahr. (temp. of room).		120° Fahr.	76° Fahr.	125° Fahr.	153° Fahr.

about 90° Fahr. in a Livesey washer. The happy result has been that for some time complaints of naphthalene stoppages have practically ceased. What the future may have in store, and whether greater extremes of temperature than have been experienced this winter, or the equally testing time of summer, will bring a recurrence of the trouble, remains to be proved. It should, perhaps, be added that some care is necessary to keep the tar as free as possible from water, which has been found to reach as much as 60 per cent. of the bulk. This for a time misled those in charge of the investigations. Although carefully measuring the daily quantity put into the washer, sufficient allowance was not made for this water. A convenient and simple remedy, and one that has proved quite successful, is to measure the tar, in tanks open for constant observation, before and after use in the washer. By thus maintaining a constant tar-seal, the naphthalene is kept to about 4 grains per 100 cubic feet of gas passing into the holders, using at present from 50 to 60 gallons of oil-gas tar per million cubic feet of gas made.

The naphthalene in the crude gas varies very considerably from time to time, and tests show unaccountably sudden changes, which explains the reason for using what may appear to be a large quantity of oil-gas tar per million cubic feet. The further precaution is taken of vaporizing into the gas about 10 gallons (varying according to the temperature of the atmosphere) of benzol per million cubic feet of gas made, in a specially constructed vaporizer, heated by steam, and fitted inside the cover of the last catch purifier. This may appear an unnecessary expense; but although later on, when the mains and services are thoroughly cleared, it is hoped to lessen the quantity of both oil tar and benzol, at present the cost is amply repaid by the freedom from stoppages, and the added illuminating value of the gas.

HIGH-PRESSURE SUPPLY TO VILLAGES.

Although following so closely upon the very interesting communications which have recently appeared on high-pressure distribution and the discharge of gases through pipes, I trust a few details of a high-pressure supply to three villages necessitating something over 6000 yards of main, may not be without interest. The first 2000 yards pass through a growing suburb of Bath, and for this distance are laid of a size sufficient to afford assistance by way of "boosting" in the near future.

After estimating the probable requirements of the three villages at about 10,000 cubic feet per hour, the first question for consideration was the size of pipes to be laid. Opinions seem to differ on this point among those who are advocating high-pressure distribution. The idea of using small pipes, supplied at somewhat heavy pressure, evidently fascinates the more daring engineers. But it is an intricate problem; and, in arriving at a solution, many points have to be taken into consideration. A 2-inch pipe supplied at sufficient pressure might suffice, but the compressing plant would need to be kept running continuously during the hours of the smallest demand, as well as when all the consumers are drawing a supply. It was, therefore, decided to lay pipes sufficiently large to distribute gas at holder pressure through the night and other hours of small demand—using the compressing plant only during the hours of heavy consumption. The main was therefore laid as follows:—

About 2000 yards of 5 inch
,, 2250 ,, ,, 4 ,,
,, 1860 ,, ,, 3 ,,

Compressors designed by the Bryan Donkin Company were laid down in duplicate, each estimated to pass 15,000 cubic feet of gas per hour at 100 revolutions per minute with 40 lbs. per square inch steam pressure (the pressure available from the existing boilers), against 10 lbs. per square inch pressure at the outlet of the receiver.

The following is a brief description of the plant. The compressors are of the rotary type, designed on Hodson's patent. In exterior the machines resemble roughly an ordinary exhauster. The internal construction differs, however, considerably. The cast-iron drum, which forms the driving member of an ordinary exhauster, in this compressor is driven round by the double slide which takes the place of a piston. The double-ended slide is directly rotated by a block of large dimensions keyed-on to a steel-driving shaft which passes through from one end plate to the other. While, therefore, the simplicity of an ordinary exhauster is retained, the design of the compressor is specially adapted for running against the much heavier outlet pressures involved; and all wear is concentrated on the driving block. The design permits of slides being used of very deep section, with a consequent increase in strength, and the broad ends running in contact with the end plates, form, with the oil present, a practically gas-tight joint. There is no end-thrust on the slide, and the nose-strips, giving broad surface contact, are automatically kept up to their work by springs in the usual way. The compressors are fitted with forced lubrication, by which all the internal working parts are automatically oiled. The compressors deliver gas into a cylindrical receiver fixed under the engine-room floor, to which the high-pressure main is directly connected. A relief pressure-valve is arranged as a bye-pass between the inlet and outlet mains of the compressors. This is set to the maximum pressure which it is intended to carry, and it also enables the compressors to be partially bye-passed when they are required to be run at a very reduced output. In addition, the steam-engines driving the compressors are furnished with special diaphragm governors, so that the speed is automatically regulated in accordance with the demand for gas.

THE GOVERNING ARRANGEMENTS.

At present, three villages are being supplied with gas from the high-pressure main. At the end of the 4-inch main, a governor pit is arranged, from which low-pressure mains branch off to the two smaller villages. Two-inch diaphragm governors are in use here, of the simple Reynolds type. Two governors serve each village—one being in reserve. The third village (Saltford), the most important place, is supplied by the high-pressure main. A governor pit is arranged at the end of the 3-inch main, in which a 3-inch Reynolds district governor is in use; a reserve governor of the simple type being at present fixed, which can be replaced later with the district type. At each governor pit safety mercury seals are provided, with vent pipes leading into the atmosphere. In the event, therefore, of a governor failing for any reason, these safety seals would prevent the possibility of the low pressure rising beyond a given limit.

TESTING THE CAPACITY OF MAINS.

Before connecting any service pipes, some tests were made of the capacity of the plant, and the discharge of air and gas at varying pressures, with a view to confirm or otherwise the theoretical formulæ at present in use. The results have been tabulated as follows.

First the plant was run at a maximum speed of 125 revolutions

per minute with the outlet of the cylinder fully open to the atmosphere. The air was measured through a station meter; and the result was found to be a discharge at the rate of 36,000 cubic feet of air per hour. This test was then pushed further, by closing the outlet valve and observing the discharge against varying pressures.

	Outlet Pressure. Inches.	Discharge of Air. Cub. Ft. per Hour.	Revolutions per Minute.
In all cases omitting figures under the hundreds.	3½ water	31,300	100
	26 ,,	31,100	100
	4¼ mercury	30,300	100
	10½ ,,	26,300	100
	about 16 ,,	24,500	97

The mains were then coupled up to the outlet of the receiver, and a series of tests made on the 2000 yards of 5-inch main. In the first column are given the figures of actual discharge of air, and in the second the theoretical discharge by Cox's formula.

Pressure on Outlet of Compressor.	Revolutions per Minute.	Actual Discharge of Air through 2000 Yards of 5-in. Pipes.	Theoretical Discharge by Cox's Formula.
2 lbs. per sq. in.	54	14,900 cub. ft. per hr.	14,460 cub. ft. per hr.
4 lbs. ,,	76	21,500 ,, ,,	20,150 ,, ,,
6 lbs. ,,	100	27,800 ,, ,,	25,380 ,, ,,

The theoretical discharge for given pressure losses is not given from this point onwards, because the pressure loss in each section of the main was not observed. The theoretical loss of pressure for each section of main has, therefore, been worked out according to Cox's formula for the discharge observed. The sum of the pressure losses for each section of main gives the total loss estimated in the third column. The 2250 yards of 4-inch main was then coupled up, making, with the 2000 yards of 5-inch, 4250 yards in all, and the compressor put to work, with these results.

Pressure at Outlet of Compressors. Lbs. Per Square Inch.	Actual Discharge of Air. Cubic Feet Per Hour.	Total Theoretical Loss of Pressure Calculated by Cox's Formula. Lbs. Per Square Inch.
1	4,800	1·17
2	6,600	2·03
4	10,300	4·75
6	13,300	7·25
8	16,100	10·50
10	18,500	13·25

The third length of main (1860 yards of 3-inch) was then coupled up, making a total of 6110 yards under test, and experiment carried forward, with the following result.

Pressure at Outlet of Compressor. Ins. of Water.	Actual Discharge of Air. Cub. Ft. per Hour.	Total Theoretical Loss of Pressure by Calculation. Ins. of Water.	
4	720	2·8	Calculated by Pole's formula.
6	840	3 8	
8	1030	6·1	
12	1285	8·3	
14	1530	12·5	
18	1670	14·1	
22	1930	19·9	
25	2100	22·5	
28	2300	27·7	
Lbs. per Sq. In.		**Lbs. per Sq. In.**	
2	3288	2·0	Calculated by Cox's formula.
3	4500	3·5	
4	5320	4·6	
5	5750	4·9	
6	6600	6·8	
7	7390	8·6	
8	7950	9·4	
9	8748	11·0	
10	9474	13·0	

Having completed these tests with air, a final test was made (on the full length of 6110 yards) with gas of specific gravity about ·45, at 10 lbs. per square inch at the outlet of the compressor. The gas was measured through a station meter in a similar manner to the air, and a series of observations taken showing an average discharge of 251 cubic feet per minute or equal to (say) 15,000 cubic feet per hour. By Cox's formula, the theoretical loss would be 13 lbs. per square inch when passing this quantity.

Loss in 5-inch main: 1 lb. per square inch.
,, 4 ,, ,, 3 lbs. ,, ,,
,, 3 ,, ,, 9 ,, ,, ,,
13 lbs. total loss.

At this pressure—viz., 10 lbs. per square inch, 9474 cubic feet of air were passed. Multiplying this by the formula

$$\sqrt{\frac{\text{sp. gr. of air}}{\text{sp. gr. of gas}}}$$

will give the equivalent discharge of gas. Assuming the specific gravity of the gas at ·45, this factor becomes 1·49, which gives an equivalent discharge of gas at 14,200 cubic feet per hour, whereas in the actual test 15,000 cubic feet per hour was the discharge—showing results fairly in agreement. For the sake of knowing the possibility of working on gasholder pressure, should the compressors be stopped, a short test was made with 6½ inches water pressure at the outlet of the cylinder, maintaining 2¼ inches pressure at the end of the 6110 yards of main; and it was found that the meter registered a discharge at the rate of 1000 cubic feet of gas per hour, with a loss of 4¼ inches of pressure. By Pole's formula, the total loss should have been 2·4 inches.

This result, combined with the other tests, shows that even for low pressures, Pole's formula gives too low a pressure loss, where the length of main is considerable, as in these tests. Another point to be noted—to which my attention was drawn in testing the discharge of gas through pipes of small diameter, at low pressure, some years ago—was the irregularities in the sectional area of the gas-way through the pipes. All pipes are not of uniform bore; and the difference materially affects the discharge.

When comparing the following figures with various others recently published, the difference is very striking. It should also be noticed that in these tests about 10 to 20 per cent. of carburetted water gas was present.

Quantity of Gas (about 16·4 Candle Power) Passed per Hour through Compo. Pipe Discharging into the Atmosphere.

Coal and Carburetted Water Gas mixed from 10-20 per Cent. Carburetted Water Gas.		20 Feet.	30 Feet.	60 Feet.	90 Feet.	150 Feet.	170 Feet.
1-inch pipe	10-10ths pressure	353	297	257	240	175	135
	20-10ths ,,	486	423	400	330	250	200
¾-inch pipe	10-10ths pressure	273	222	140	109	98	92
	20-10ths ,,	375	303	210	187	144	132
½-inch pipe	10-10ths pressure	100	80	50	40	34	31
	20-10ths ,,	140	110	70	..	58	57
⅜-inch pipe	10-10ths pressure	46	38	20	19	11	..
	20-10ths ,,	54	46	40	25	12	..
¼-inch pipe	10-10ths pressure	30	23	15	12	..	..
	20-10ths ,,	47	38	23	19	..	..

The discharge from wrought-iron pipes of nominally equal size was considerably greater than the above figures for compo. pipe; and it is evident that the actual bore of tubing on the market varies considerably.

VARYING CONSUMPTION OF COOKING-STOVES.

Before passing from the question of pressure-raising plant, I may add that some time ago we were faced by such an increasing demand in a district some seven miles from the distributing station, that the mains were overtaxed during the hours of cooking on Sundays in summer only; the gasholder pressure affording an ample supply at all other times. It became a question whether a larger main should be laid for this occasional demand; but the alternative of a compressing plant driven by a gas-engine was decided upon, and has indefinitely and most satisfactorily postponed the inconvenience and outlay which larger mains would have involved—the compressor being put to work only when the gasholder pressure is insufficient.

This occasional heavy draught on the distributing mains for purposes of cooking and heating, raises an important question as to its effect on overworked consumers' meters. In order to determine the quantity of gas which can be taken through a cooking stove a number of interesting tests were carried out. It was found that stoves from various makers differed considerably in this respect. Without wearying you here with too many figures, it may be stated that small stoves, as supplied to slot consumers, at a pressure of 20-10ths, will pass from 48 to 60 cubic feet per hour; the quantity increasing with the size of the stove, until the largest used by ordinary consumers was found to burn as much as 160 cubic feet per hour, with all the jets burning. Gas-fires vary from 25 to 180 cubic feet per hour, and geysers from 40 to 180 cubic feet.

METER TESTS.

The object of these experiments being to ascertain the work a consumer's meter might be called upon to perform, the investigation was completed by testing several meters to ascertain the percentage of error when working beyond the normal capacity.

Size.	Nominal Capacity Cubic Feet per Hour.	Gas Passed at 25-10ths Pressure Open Outlet. Cubic Feet Per Hour.	Percentage of Error.
3	18	About 180	Varied from 3·5 per cent. fast to 20 per cent. slow.
3 auto	..	,, 120	
5	30	,, 250	
10	60	,, 310	
20	120	,, 660	
30	180	,, 800	
50	300	,, 1320	

It will be seen from these figures the quantity of gas meters will pass when working with practically an open outlet, and while some, when tested under such conditions, show most excellent results, yet, in the majority of meters, the error in registration is very considerable, and usually on the "slow" side. The tests confirm what is already so well known—that the rules to be observed by inspectors in testing meters under the provisions of the "Sales of Gas Act" need amendment. This Act was passed when dry meters were little known, and when the conditions of supply differed greatly from to-day.

Dry meters will pass gas in quantities so much in excess of the nominal capacity without inconvenience to the consumer—but, in the majority of cases, with considerable loss to the suppliers—that, until some amendment is made, it is necessary to keep a vigilant eye on the quarterly readings to detect cases in which meters are being overtaxed.

BURNER TESTS.

In these days of keen competition, the question of burners and mantles is one calling for careful attention. The profusion of

Results of Tests of Various Incandescent Burners.

Burner.	Conditions.	Consumption. Cubic Feet per Hour.	25/10.		30/10.		Remarks.
			C.P. Corrected.	Candles per Cub. Ft.	C.P. Corrected.	Candles per Cub. Ft.	
A	XXX mantle and small mantle protecting glass not made for use with a Chy.	4* G.A.	65·53	16·38	66·33	16·58	Mantle not fully illuminated.
	XXX mantle and 6-inch Jena Chy.	4* G.A.	75·71	18·93	81·63	20·41	
B	XXX mantle, "C" bulb, enamelled Chy., and small "C" glass	4* G.A.	55·22	13·80	63·05	15·76	Mantle not fully illuminated.
	XXX mantle and 6-inch Jena Chy.	3·9‡ governor	78 10	19·52	81·19	20·29	Burner absolutely silent and mantle well illuminated.
C	XXX mantle and 6-inch Jena Chy.	4* G.A.	84·02	21·00	88·04	22·01	Burner hisses slightly.
	XXX mantle, "C" bulb, enamelled Chy., and small "C" glass	4* G.A.	63·32	15·83	70·35	17·59	Burner hisses slightly and mantle not fully illuminated.
	XXX mantle and 6-inch Jena Chy.	3·9‡ governor	82·89	20·72	85·83	21·46	Burner quite silent. Top of mantle not quite fully illuminated.
	XXX mantle, "C" bulb, enamelled Chy., and small "C" glass	3·9‡ governor	66·73	16·68	70·63	17·66	Burner silent.
	XXX mantle, 6-inch Jena Chy., placed inside "C" bulb and enamelled Chy.	3·9‡ governor	79·05	19·76	89·32	22·33	Do.
D†	XXX mantle and 6-inch Jena Chy.	4* tap	69·32	17·33	69·92	17·48	Burner practically silent.
	Do. 8-inch do.	4* tap	65·14	16·28	65·14	16·28	do.
	Do. "C" bulb enamelled Chy. and small "C" glass	4* tap	52·41	13·10	59·84	14·96	Burner practically silent and mantle fairly well illuminated.
	XXX mantle and 6-inch Jena Chy.	3·9‡ governor	72·21	18·05	72·64	18·41	Burner absolutely silent. Mantle not quite illuminated.
E†	XXX mantle, "C" bulb enamelled Chy. and small glass	4‡ governor	64·82	16·40	69·32	17·33	Burner practically silent. Mantle not quite fully illuminated.
	XXX mantle, no glasses at all	4‡ governor	58·89	14·72	63·59	15·90	do.
F	XXX mantle, "C" bulb enamelled Chy. and small "C" glass	4* G.A.	43·57	10·89	45·18	11·29	Burner hisses slightly. Mantle not quite fully illuminated.
G	Plaissetty mantle, "C" bulb enamelled Chy. and small glass	4 tap	62·07	15·52	64·10	16·02	

G.A.—Gas regulated by means of gas-adjuster on burner.

Tap.—Gas regulated by means of tap on photometer (there being no gas-adjuster on burner).

Governor.—Gas regulated by means of governor. Result afterwards corrected to 4 cubic feet.

Air adjusted in each case except those marked † (which had no air-adjuster) to give best results.

Marks * and ‡ indicate that same mantles were used for all tests so marked.

Harcourt's 10-candle power pentane standard used and Simmance-Abady flicker photometer in all cases.

Gas used had an illuminating power of about 15·5 candles.

types and makes upon the market, has reduced prices to remarkably low figures; and if cost were the sole consideration, the public would indeed be well served. But when samples of those in every day use are tested for lighting power, the difference in efficiency is found to be so great that systematically testing each burner sold is becoming almost a necessity, if the full value of the gas used is to be secured to the consumer.

The figures in the above table give tests recently taken of some well-known burners.

The effect of increasing the pressure and properly regulating the air and gas supply, and of changing the mantle and chimney, is so marked on the illuminating results, that it is safe to say that a burner and mantle testing department is becoming increasingly necessary in all up-to-date works. Experience suggests that samples of mantles should be taken from every consignment received into the stores, and tested for strength, durability, shrinkage, and capacity for becoming fully illuminated without waste of gas. The length and fitting of mantle rods, although apparently a small matter, is one that deserves consideration. Loose fitting rods doubtless are answerable for the shortened life of many mantles. A slight difference in the length of a rod affected the illuminating power of the mantle from 2 to 3 candles per cubic feet of gas consumed.

METERS AND BYE-PASS CONSUMPTION.

I have been rather curious to learn a little about the actual consumption of bye-passes, and the proportion of gas so used which gets registered by the ordinary consumer's meter. It is reasonable to assume that in these days few houses are without some burners having bye-passes consuming gas night and day. The question has doubtless presented itself to the minds of most managers as to how much of this gas gets paid for.

The following figures may therefore be of interest. Meters were taken haphazard from stock and connected to a bar furnished with "C" burners; the bye-passes being tested just as they were received into the stores. The gas was carefully measured from a test-holder, and the registration of each meter was noted before and after the bye-passes had been kept alight for eleven hours—the first day with one bye-pass only, the second with two burning, and so on daily up to six.

According to these figures, the average bye-pass consumes rather more than 4 cubic feet per twenty-four hours. The results speak for themselves, and add emphasis to previous remarks on the need for revising the methods of meter testing. Although much of the gas passed without registration, it was gratifying to find how satisfactorily certain meters stood this somewhat severe test. In consequence of the increased pressure under which gas is now supplied, makers no doubt find it necessary to more carefully pack the stuffing-boxes with a view to prevent escape of gas round the rods; and this accounts, in a measure, for the failure of some meters to register when one bye-pass only was burning.

MUNICIPAL COMPETITION—COST TO RATEPAYERS.

Our friend the electric light still remains an attractive subject for discussion; but the few remarks I have to make deal not so much with the electric light itself, as with the methods adopted by municipal authorities carrying on such undertakings. No serious objection is raised to legitimate competition; but in the interests of ratepayers, attention should be drawn to present day methods of municipal trading. It seems to be forgotten or ignored that gas companies have still to be included in this category, and are not only among the largest ratepayers in every town, but take a leading place as employers of labour. As such, they may surely claim to have some voice in municipal affairs.

I have recently been looking back through the annual statements of the accounts of the City of Bath. Municipal methods, I imagine, are much the same in other places; and certainly the figures furnish food for serious reflection. Although the electric light has been in the streets since 1891, the concern has been owned by the Corporation for some ten years only, and already has cost the city rather more than £162,000 in capital outlay, without reckoning some £5000 to £6000 taken from the rates from time to time, to meet (*a*) deficits in the early years, (*b*) the cost of obtaining Provisional Orders, (*c*) alterations to mains, lamps, &c., and (*d*) the fitting-up of various municipal buildings with electric appliances. Although it is claimed that the concern has not become a direct charge upon the rates, yet the expedients adopted to avoid this deserve notice. With an income last year on revenue account of rather more than £20,000, considerably more than £5000 of this amount was drawn from the city purse for lighting a few of the street and various public buildings. This fact of itself would not constitute any cause of complaint, if the result was economy

6 a.m. to 5 p.m. Size of Meter.	1 Bye-Pass.		2 Bye-Passes.		3 Bye-Passes.		4 Bye-Passes.		5 Bye-Passes.		6 Bye-Passes.	
	Meter.	Test Holder.	Meter.	Test Holder.	Meter.	Test Holder.	Meter.	Test Holder.	Meter.	Test Holder.	Meter.	Test Holder.
	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.
3 Light . .	2·0	2·9	3·6	4·2	5·4	6·0	6·6	7·1	8·3	8·7	—	—
5 ,, . .	·375	2·25	3·7	4·2	—	—	—	—	—	—	—	—
5 ,, . .	2·3	2·6	3·5	3·8	4·7	4·8	6·2	6·4	8·2	8·4	11·1	11·2
5 ,, . .	2 5	2·9	3·7	4·0	5·2	5·6	6·7	6·9	9·3	9·4	11·2	11·2
10 ,, . .	2·0	2·8	3·7	4·1	5·1	5·6	6·6	6 9	8·7	9·0	11·0	11·3
20 ,, . .	1·5	3·0	·5	4·2	2·5	5 6	6·5	7·2	7·6	9·4	11·0	11·8
30 ,, . .	2·5	3·0	3·4	4·1	4·3	5·0	6·0	6·8	8·0	9·0	11·0	12·0

All tests made at 30-10ths pressure.

in lighting or heating; but, on comparing the cost now with the figures when gas only was used, the result is not comfortable reading from a ratepayer's point of view.

The cost of public lighting has gone up from about £5000, the year before any electric light was introduced, to about £8500 for year ending March 31, 1909, notwithstanding reductions in the price of gas from 2s. 8d. in 1891 to 1s. 11d. in 1909, equivalent to about £1000 per annum on the present number of lamps. It will, of course, be said that the city has grown, and more light—that is a greater number of lamps (and incandescent burners in all the lamps) is needed. But after making such allowance, it is no over-estimate to state that if only gas were used, the city could be equally well lighted at a saving to the ratepayers of more than £2000 per annum.

Another point. By some arrangement (the secret of which many of us would like to learn), the amount paid in rates and taxes is so controlled that the figure shown in the accounts is lower by upwards of £1000 than it should be if the Gas Company is fairly rated on profits shown.

But that is not all. If I read the figures correctly, something like 500,000 units are being sold at less than cost price, if in speaking of cost price we include interest on capital equivalent to 0·84d. per unit, and contributions to sinking fund equal to 0·85d. per unit sold. These two items added to the manufacturing and distribution costs, make a total cost of 3·36d. per unit sold. The bare cost of manufacture, distribution, &c., works out to 1·67d. per unit sold, and yet some consumers have been attracted to the municipal electricity by a charge of a mere 1¼d. per unit. At this price over 250,000 units were sold last year, not taking into account a trifling sum of £500 given away as discount. If my figures are correct (and I have taken some pains to keep well on the safe side), the ratepayers are paying some thousands of pounds for the luxury of indulging in municipal trading to which the Gas Company has to contribute its large share—thus in reality paying for forging the weapon with which an attempt is being made to cripple its resources, if not to end its existence. The attempt, though comparatively harmless, is costly, and confirms the remarks of the Governor of the Gaslight and Coke Company, who, in referring to this question of municipal trading, said "the situation, for which there is no legislative remedy, calls for searching investigation and prompt action."

STANDARD TEST-BURNER.

A word should perhaps be said as to the new standard burner and the Bill at present before Parliament authorizing its use by a number of companies. The facts that the existing standard burner No. 1, after doing duty for more than forty years, has become obsolete and unfit for testing the gas to-day, and that a large proportion of any advantage which may result from the use of the new burner must ultimately pass to the consumer, also that the No. 2 burner is now imposed in all Acts and Provisional Orders granting fresh powers to companies or—and this should be noted—local authorities, and is the prescribed burner in the Model Gas Bill, seem to be entirely lost sight of by the local authorities opposing the measure.

Whether gas companies should oppose the imposition of the calorific test (without penalties) is, to my mind, an open question, assuming the standard was a reasonable one and the illuminating power standard dropped. In this connection, it is interesting to note that there does not appear to be any burning desire on the part of local authorities to ask for greater stringency in testing the heating and lighting value of electrical appliances. A suggestion has been made to me by a director of an important company recently, that, for the sake of efficiency and uniformity, the time has come for the Institution of Gas Engineers to seriously take up the question of the promotion of a Consolidation Bill embracing such matters as the standard burner, sulphur clauses, and the amendment of the Gas-Works Clauses Act and the Sales of Gas Act. Representing as it does all the gas undertakings in the United Kingdom, its usefulness would be greatly increased, and the industry be considerably benefited by such action. The necessary financial support would doubtless be forthcoming; and no one can dispute the need for amendment in these directions.

LABOUR EXCHANGES.

During this year, the Labour Exchanges Act has come into operation. It is interesting as a national experiment to provide employment for those able and willing to work. The Exchanges will probably be useful as an organized effort to attract capable men to places where their services are required; but the gas industry has its regular army of workers, recruited at times from suitable men in their own towns who have already registered their names in the books of the company as applicants for work. Such a register, I imagine, is to be found in all large gas-works; and a most useful addition to it is found in a systematic entry of each man's character as he leaves the employment after the winter season. Whether keeping a central register, and thus placing the responsibility for finding work on the State, instead of on individuals, will be for the good of the nation, remains a question which we must wait for time to answer.

SUNDAY LABOUR.

Before closing, may I be permitted to touch on a question which for many years has deeply interested me. It may be that few works to-day carry on gas-making on Sunday; but if any present are still of the opinion that Sunday labour is necessary, I would like to say that for a long period the works under my charge were closed-down every Sunday from 6 a.m. to 10 p.m. in the summer, and from 6 a.m. to 6 p.m. in the winter. A further step has been found possible during recent years, and no work has been done on any Sunday before 10 p.m. excepting that required to the fires or in connection with repairs which could not be undertaken when the plant was at work. The effect is all for good; and although it may be that in some works such a closing-down is not possible, yet, whether considering the well-being of the workers or the comfort of the executive, I strongly recommend for your consideration—and this after long experience of the result—the achievement of a silent gas-works on every Sunday in the year.

At the close of the address,

Mr. W. E. Price (Hampton-Wick) said the high position the Association had held from year to year and for many years, he was sure, had not suffered, and would not suffer, in any degree at the hands of the gentleman they had chosen to be their President for the ensuing year. The address to which they had listened, he was certain, would rank as one of the best, if not the best, that had been heard in this or any other similar Society. He thought they might say that the range of subjects that had been dealt with by Mr. Ellery might be called a "King's Treatise" condensed. The food for study and inquiry that had been supplied in it would keep them occupied for a long time. He did hope there would be a discussion on the address, because he felt sure there were many present who were anxious to say something on many of the points raised. The subject of naphthalene had not been kept out of the address, and that was one that must be attractive to many members, but he hoped to a less number of them than a few years ago.

Mr. Frank Livesey (Maidstone), in seconding, said the address was one of the most valuable they had heard for many years. Year by year presidential addresses were becoming more and more a *résumé* of the most important things appertaining to their work that were current in their minds. The experience with naphthalene and the washing by means of water-gas tar was interesting to him (Mr. Livesey), because it almost entirely coincided with his own experience. He should like to add that the spirit which dominated the Bath Corporation in their methods of trading was similar to that dominating the Maidstone Corporation

The motion was cordially passed.

The President, in his acknowledgment, said he would take the members into his confidence by saying that having got through the address was a great relief to him; for "it was a poor thing, all mine own." That was what had been on his mind the last two or three weeks, since he had been struggling with the preparation of it; but members of Gas Managers' Associations were always very kind. It was extremely good of the members to receive the address as they had done. If he had said anything in the address that would be useful, he was pleased. There might be some points in it upon which members would like to say something; and, if so, it would make the afternoon more useful.

On Gas Washing and Other Matters.

Mr. James W. Helps (Croydon), invited by the President, said he was not at all sure that he entirely agreed with the subject-matter of presidential addresses being discussed. He could not help remembering that before long he should have to prepare an address; and if what happened at the present meeting were taken as a precedent at the meeting he had more particularly in mind, he should be extremely sorry. [Laughter.] He did not intend, therefore, to discuss or criticize any of the points that had been raised by Mr. Ellery. He could only agree with those who had already spoken that this was an address that teemed with information, and that would supply subject for a considerable amount of thought and study for every one of them in the future. He had had a good many opportunities during the past thirty years of seeing Mr. Ellery's works at Bath. Frequently in his office he had talked over with Mr. Ellery a great many of the points with which he had dealt in his address that day; and he (Mr. Helps) knew that their President had given much attention to every one of the matters treated upon. With regard to the question of the use of tar or liquor in the seals, he knew that Mr. Ellery had changed from one to the other a good many times. He took the fact that Mr. Ellery now retained the tar-seal as clear proof of his conviction that the tar-seal represented "the survival of the fittest." With regard to the use of water-gas tar in washers for dealing with naphthalene, the President might supplement what he had said by stating where he placed the tar-washers. There were two methods of dealing with the washers. At Croydon they placed a Livesey washer in front of the condensers; the plan the President had adopted, he rather fancied, was to place the washer after the condensers, using it purely as a naphthalene washer. As could be imagined what they were trying to get at differed in the two cases. In his own case, he did not use it entirely as a naphthalene washer. He used it more with the idea of putting into the gas those light hydrocarbons with which the tar oil was charged. So that when the gas went into the water-tube condensers, and was there suddenly cooled, these light oils kept the naphthalene in solution, and prevented any trouble from it. He did think that naphthalene was a lesser difficulty now than it was some time ago, because there had been so much said and written on the subject, and so much work had been done in relation to it, that the trouble had now nearly reached the vanishing

point. In his own town, where, a few years ago, they used to talk of naphthalene complaints weekly in hundreds, they now found hardly any complaints at all. Mr. Caddick, his Chief Assistant, only the week before brought him a return which showed that in the previous fortnight they had only had two complaints with 40,000 consumers. In reference to high-pressure distribution, it was a point that was receiving very great consideration from everybody now. It was a matter of supreme importance, because it avoided the necessity, if they adopted it, not only of enlarging mains, but sometimes of adding considerably to the storage capacity of their holders. In this connection he could only say, regarding the concluding paragraph of the address, that the use of the booster was going to enable gas undertakings that were unable to do so before, to do away with Sunday labour. They must recognize when the storage capacity was small, that it was necessary to make sure, when they stopped on Sundays, that they would not be put in a difficult position by finding the holders too low at night to give the necessary pressure. With a booster in use, there never need be any fear of such a position. It was a step in the right direction. He congratulated the Association upon their President's address.

Mr. H. W. Woodall (Bournemouth) said there was one question as to the formation of breeze by coke-conveyors, fear of which he believed had kept a good many people from using them. The matter was alluded to in the President's able address; and it seemed to him (Mr. Woodall) that it all depended upon how much breeze was wanted as to whether or not it was going to affect them to any considerable extent. For instance, they all at the present time had to use a lot of steam on their works; but at Bournemouth they only made enough breeze to meet their requirements. This being so, they were in the same position that they were in before putting in coke-conveyors, though a little more breeze was now made. By the use of under-feed stokers, they were able to get an actual evaporation of 6 lbs. of water per pound of fuel. He would therefore like to know if the President considered the formation of breeze was a serious item; and if he considered it one that should be brought forward as an objection to coke-conveyors.

The President, in answer to Mr. Helps, said at Bath they had the Livesey washer after the condensers and before the scrubbers. He was inclined to think that steaming the tar in the hydraulic mains did liberate some of the lighter oils, and that, when these were carried forward with the gas, they did their share in bringing down the naphthalene. But naphthalene was always such a treacherous jade that one was almost afraid to mention her, because, just when one thought one had got her, there was disappointment. At any rate, at the moment it seemed to him they had got her, and had tarred her out of existence. What did get through the condensers was intercepted by the oil-gas tar in the Livesey washer. He knew that this was different to the way Mr. Helps was working; but each of them had reached the goal by his own road. As to the use of coke-conveyors, in their case it had tended to increase the quantity of breeze—perhaps because they were passing the coke over mechanical screens. He was not quite sure, if he were re-designing this particular plant, that he should again put in a mechanical screen. He thought if the coke was allowed to find its way down a fixed screen, the tendency would be to produce less breeze, though it might not take it out quite so completely from the larger coke. As to this being a sufficiently serious matter to interfere with the introduction of coke-conveyors, he did not wish to infer that for one moment.

Mr. Woodall observed that he did not suggest that the President had inferred it. He merely wished to know whether the President regarded the small amount of additional breeze as a serious matter.

The President said he did not think it was serious; but it was a fact. It would be understood, too, that he did not wish to make comparisons with other methods of handling coke. There was such a considerable saving attending the use of conveyors that a little extra was not by any means a serious matter.

Mr. W. E. Price (Hampton Wick) remarked as to the position of the washer, that he had for the last two years had his in exactly the same position as the President; and it had had the effect of absolutely clearing naphthalene off the works. He had done nothing else. Previous to using the washer in this position—after the condensers and before the scrubbers—he had the outlets of the holders interrupted and had naphthalene deposits in other places. Since he installed the washer in the position named, he had not seen naphthalene on the works. They considered they had chosen the better position of the two, though he was not prepared to state that it was actually so. In his own case, it had been a good position. But to guard against trouble in the district, after the gas left the holders they saturated it with the vapour of kerosene. That was to say, the gas was passed over the surface of kerosene, which was kept hot by steam. The effect of doing this for about three years had been that the condensed heavy oil charged with naphthalene was found in, and was pumped from, the syphons three miles from the works. It began by depositing quite close to the works, and it gradually had receded until now it was only discovered at the remote ends of the district. It was always to be found in the oily film on the water pumped from the syphons. Now instead of the complaints being about 3 per cent., they had been reduced to 0·3 per cent. He could not say he only had two complaints from 40,000 consumers; he should like to. But he thought that in his case he had had an undue proportion of naphthalene remaining in his mains; and it had taken all this time to get it out.

This concluded the proceedings.

In the evening the members dined together. A toast list and a programme of music were afterwards passed through, and a felicitous time was spent.

Subsequently, several of the members made their way to Blackfriars Bridge approach to inspect the new high-pressure gas-lamps there, with raising and lowering gear. They were met by Mr. W. J. Liberty, the Lighting Inspector of the City of London, and President of the London and Southern District Junior Gas Association.

FELD'S PROCESS FOR OBTAINING AND UTILIZING SULPHUR FROM SULPHURETTED HYDROGEN AND SULPHUR DIOXIDE.

One of the series of English patents taken out by Herr Walther Feld, of Hönningen-on-the-Rhine, was accepted on the 8th ult.—No. 3061, dated Feb. 8, 1909; and the specification has since been issued. It forms interesting reading in conjunction with the article the patentee contributed to our columns last September (Vol. CVII., p. 816); and though somewhat lengthy, it will bear reproduction to a large extent *verbatim*.

The invention relates principally to the treatment of sulphuretted hydrogen and sulphur dioxide so that the sulphur obtained may, if desired, be utilized for the regeneration of the sulphur dioxide used in the process, or to obtain sulphuric acid or sulphuric acid salts. The sulphuretted hydrogen and the sulphur dioxide may be in a pure condition, and either or both may be mixed with other gases. For example, the sulphuretted hydrogen may be contained in coal gas, and the sulphur dioxide in gases from sulphur ovens, in which sulphur is burned with air.

To carry out the invention, the gases containing sulphuretted hydrogen and sulphur dioxide respectively—presuming that the gases are not taken in their pure condition—are treated, either simultaneously or one after the other, with a liquid containing, in solution or suspension (or partly one and partly the other), compounds of metals, the sulphides of which, on the one hand, are insoluble in basic, or in neutral, or in some cases in weak acid, solutions, and, on the other hand, are decomposed by sulphur dioxide alone, or by sulphur dioxide in the presence of air, or other oxidizing agent, or sulphur, or basic, or acid, substances, or of a mixture thereof. Such compounds are, for instance (subject to the disclaiming note preceding the claims*), the oxides, hydroxides, carbonates, sulphites, thionates, and all basic salts, as well as the neutral or weak acid salts of zinc, manganese, iron, or other metals, the sulphides of which answer the before-mentioned requirements. For example, precipitated iron sulphide is insoluble in neutral or basic solutions, but is dissolved by sulphur dioxide. Zinc sulphide is insoluble in basic, or in neutral, or in dilute, acid solutions—particularly if they be weak acids. Therefore sulphuretted hydrogen will precipitate zinc sulphide from a basic, or an acid, or a neutral solution of zinc acetate, or zinc sulphite, or of other salts of zinc with weak acids.

The way of performing the process according to this invention will vary according to the special condition of the gases containing the sulphuretted hydrogen or the sulphur dioxide, or both, and according to the metal and the compound of it which is used. If, for instance, zinc oxide be used for the extraction of sulphuretted hydrogen from coal gas, the zinc oxide is suspended in water, or in other suitable liquid (such as salt solution, oil, or the like), and the coal gas is treated with this suspension. By the action of the sulphuretted hydrogen in the coal gas, zinc sulphide (ZnS) is formed. If the suspension, now containing zinc sulphide (alone or together with undecomposed zinc oxide) be treated with sulphur dioxide, or with gases containing sulphur dioxide, the sulphide is decomposed, forming free sulphur and a soluble thiosulphate, or polythionic salts of zinc, or both. [For brevity, the patentee refers to the thiosulphates, polythionates, and their compounds, as "thionates."] The solution is again used for treating gases containing sulphuretted hydrogen; but the reaction is somewhat different from that already stated. The thionates are decomposed, and zinc sulphide, together with free sulphur, is formed. By treating this solution alternately with sulphuretted hydrogen and sulphur dioxide, the reaction between both gases, by means of the zinc compounds, goes on continuously.

Instead of beginning with the treatment of sulphuretted hydrogen by the zinc oxide suspension, the operation can be started

* This says: "I am aware that it has been proposed to recover sulphur from sulphuretted hydrogen by adding an equivalent proportion of sulphurous acid gas thereto and passing the gaseous mixture through a chamber containing oxide of iron or bricks at a high temperature, and also to add oxygen and inert gases in suitable proportions to the said gaseous mixture; and I make no claim to this."

with sulphur dioxide. In this case, zinc sulphite ($ZnSO_3$) is first formed from the zinc oxide; and this, if treated with sulphuretted hydrogen, is decomposed—forming zinc sulphide (ZnS). Sulphur dioxide is liberated; and this, in *statu nascendi*, and before accumulating in the liquor, is decomposed—forming free sulphur and water by its action upon the sulphuretted hydrogen. The operations then proceed as already described.

Instead of treating the gases alternately with the liquor containing the zinc compounds, the gases may be treated simultaneously therewith, or they may be mixed together before they are treated with the liquor. The amount of sulphur formed in the liquor is always according to the proper proportion of the respective gases. If there be less of one gas than is necessary to complete the reaction, the excess of the other gas will be nevertheless absorbed by the zinc compounds. By afterwards treating the liquor with gas such as that which was deficient in the gas mixture, the reaction will be completed in the liquor. Whatever may be the intermediate compounds formed, they do not interfere with the final reaction; the result being always free sulphur—that is to say, the sulphur dioxide, reacting upon the zinc sulphide, forms thionates and free sulphur; and the sulphuretted hydrogen, acting upon the thionates, forms, again, zinc sulphide and free sulphur. Both zinc compounds are alternately decomposed and regenerated.

The liquor for the treatment of the gases may be used boiling, warm, or cold; the reaction in any case being complete. The gases may be hot or cool. The liquor will gradually accumulate sulphur. If the sulphur be dissolved by the liquor, it can be separated from it by crystallization; while if it be insoluble in the liquor, it can be separated from it by filtration, or decantation, or by melting it out of the liquor. The separation of the sulphur can be effected at any convenient stage of the process; but it is most conveniently effected after the treatment with sulphur dioxide, when the zinc compounds are dissolved. For the purpose of melting the sulphur, the liquor is heated to a temperature at which sulphur melts—namely, from about 110° to about 160°C., or even above the latter temperature—the heating being effected under steam pressure, directly or indirectly by steam or other heat. By the action of the superheated liquor, the sulphur is melted in the liquor and separates and collects at the bottom of the vessel in which the superheating is effected. Air may be blown through the liquor before the melting (or filtering) process, in order to get rid of the excess of sulphur dioxides or sulphuretted hydrogen absorbed in the liquor.

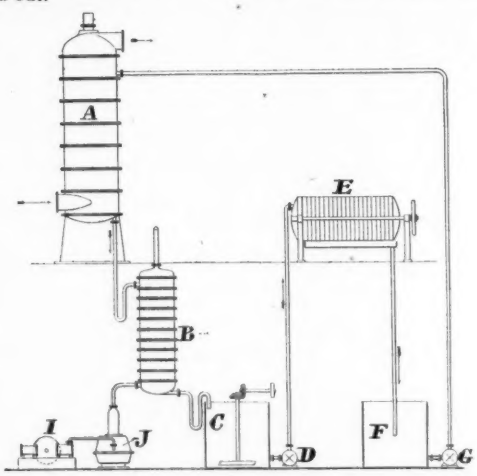
By the alternative (simultaneous) and frequent treatment of the liquor with the gases and air and by heating, some zinc sulphate is formed besides thionates and free sulphur. Such zinc sulphate, if in neutral or acid solution, will have a poor reaction upon sulphuretted hydrogen. In this case, any basic compound (solid, or in solution, or suspension) or a salt with a weak acid, such as sulphite, thionate, or acetate, or a sulphide (in solid form, or in suspension, or in solution), may be added to the liquor, by which the zinc sulphate will be decomposed. The liquor also may be treated with gases containing ammonia alone, or ammonia and sulphuretted hydrogen—such as illuminating gas, coke-oven gas, and the like. In this case, the liquor will simultaneously absorb ammonia and sulphuretted hydrogen; soluble ammonium sulphate and insoluble zinc sulphide being formed, which can be separated by decantation or filtration. There may be more ammonia in the gas, or in the liquor to be added, than is equivalent to the zinc sulphate. In this case, besides ammonium sulphate, ammonium thionates will be formed, which can easily be transformed into sulphate, as will be explained. The ammonium sulphate solution may be used for any required purpose, and it may be distilled, or concentrated, and crystallized. The zinc sulphide (without or after being separated from the ammonium salt solution) is reacted upon by treatment with sulphur dioxide before described.

In cases where the gases containing sulphuretted hydrogen contain also ammonia, it may be convenient to increase the formation of zinc sulphate by heating or boiling the liquor which contains the suspension of zinc sulphide and sulphur, or the solution of thionates (which may also contain free sulphur and zinc sulphide) when treating it with sulphuretted hydrogen, or sulphur dioxide, or air, or with a mixture of these gases. Thus the sulphuric acid necessary for the formation of ammonium sulphate is formed from the sulphuretted hydrogen or sulphur dioxide of the gas itself. By regulating the heat and the air supply, the formation of sulphuric acid may be regulated according to the amount of ammonia in the gas. Also ammonia from other sources may be used—such as gases or vapours containing ammonia, or weak acid salts of ammonium, virgin liquor (that is, liquor condensed in the ordinary process of gas purification and containing ammonia in solution), and the like; and this ammonia may be transformed into sulphate by heating it with the zinc liquor and air, during or after the treatment of the liquor with sulphuretted hydrogen or sulphur dioxide. As soon as the sulphate has accumulated in the liquor, this may be treated with gases containing sulphuretted hydrogen, alone or together with ammonia, until all the zinc in solution is precipitated in the form of zinc sulphide; or the zinc in solution may be precipitated in any other way—for example, by adding ammonia or other basic substance which will precipitate zinc compounds. The liquor then containing only ammonium salt in solution is separated from the zinc sulphide by decantation or filtration.

The sulphur recovered by either method can be used as required. Part of it may be burned to sulphur dioxide for treatment of the zinc sulphide when the process is used for the purification of gases containing no sulphur dioxide, but sulphuretted hydrogen, either alone or together with ammonia. Instead of procuring the sulphur dioxide necessary for this process by burning sulphur, the liquor containing the zinc sulphide may be treated with extraneous gases containing sulphur dioxide. Suitable gases, the patentee mentions, are the gases from boiler furnaces, or from ovens (in which coal, ore, or other matter containing sulphur and yielding sulphide dioxide, is burned), gas-producers, retorts, or the like, and which gases contain sulphur dioxide produced from the sulphur in the fuel or ores.

The foregoing examples do not specify all the ways in which the process may be carried out, as they will vary according to conditions and requirements; but from the said examples the treatment generally will be understood.

The patentee concludes by explaining, with reference to an accompanying drawing, one way in which the process may be carried out.



A is a vertical gas-washer, and B is an absorption tower—both containing a number of superposed chambers. C and F are tanks for liquor. E is a filter-press. D and G are pumps. I is an air-compressor, and J is a sulphur oven. Presuming that the apparatus is to be used for the extraction of sulphuretted hydrogen from coal gas, the gas would first enter the washer A, and be treated in this washer by liquor containing (for example) zinc thionates. By the action of the liquor, the gas is purified and leaves the top of the washer. The liquor is constantly pumped up into the washer by the pump G. When the liquor leaves the washer, it contains sulphide of zinc as well as sulphur and undecomposed zinc thionates; and it enters the absorption tower B by the syphon pipe shown, and, while the liquor runs through it, air, containing sulphur dioxide, is blown through B—the air and sulphur dioxide entering at the lower left-hand side. The liquor absorbs sulphur dioxide, and this acts upon the zinc sulphide, regenerating zinc thionates and forming free sulphur. The liquor leaving B by the right-hand syphon pipe enters the tank C, where it is stirred by the stirrer shown until all, or nearly all, of the zinc sulphide is decomposed. Then the liquor, containing the regenerated zinc thionates in solution and free sulphur in suspension, is pumped by the pump D, up into the filter-press E. The insoluble sulphur is retained in this press, and the liquor runs into the receptacle below, and, by the down pipe, to the tank F, whence it is pumped, by the pump G, again to the washer A. The sulphur from the filter-press E may be dried and burned in the sulphur oven J. For this purpose, air is blown into the oven by the air-compressor I. The gases coming from the oven (which gases contain sulphur dioxide, together with excess of air) enter the tower B; and the waste gases, after having given off their sulphur dioxide to the liquor running through the tower B, leave this apparatus by the pipe at the top.

Society of Engineers (Incorporated).—We learn from the Secretary (Mr. A. S. E. Ackermann, B.Sc.) that the new Society formed by the amalgamation of the Society of Engineers and the Civil and Mechanical Engineers' Society has now been incorporated under the Companies Act. This necessitated the preparation of a Memorandum and Articles of Association and the framing of fresh bye-laws, which contain many new features. Among these may be mentioned the creation of a new class of Fellows, admission to which is to be by examination, the reduction of the subscription for junior members, the establishment of a lending library, and the starting of a business directory and an employment register. Changes have also been made in the method of voting. The papers read before the Society are now issued in twelve monthly parts, instead of in one volume at the close of the year, as before. They are thus brought earlier under the notice of the members. The new conditions show that the Councils of the two constituent Societies are doing their best to render the usefulness of the new body as great as possible.

APPLICATION OF HIGH-PRESSURE GAS TO FURNACE USE.

By A. W. Onslow, of the Woolwich Arsenal Gas-Works.

[Summarized Report of a Paper read before the London Section of the Society of Chemical Industry on Monday last week.]

Many years' experience in the employment of coal gas for heating purposes have led me to the conclusion that the methods commonly employed—taking the gas from the town mains, and using it in a bunsen burner—were not only wasteful, but quite incapable of giving anything like a constant temperature, or of heating-up an oven or other apparatus to the like temperature in the same given time for consecutive operations. With an ordinary burner, and gas of the same composition, the variation in the time of heating-up a furnace to a certain temperature may vary in succeeding days as much as two hours. I have found large variations in both consumption and temperature, through the pressure and air supply constantly changing. In drawing gas from an ordinary main in which it is at (say) about 20-10ths pressure, using one furnace the temperature may be right, but on putting on a second furnace, the pressure immediately goes down, but the air supply remains practically the same. I have seen furnaces connected up one after the other, and the pressure has been drawn down to 7-10ths. The consequence has been that not one of these furnaces has been properly adjusted for the differences in pressure thus occasioned; and the air supply has been fluctuating between 5 lbs. and 25 lbs. during the whole of the time. Thus sometimes a regular furnace temperature is not obtained in six, seven, or eight hours, when it ought to have been reached in probably twenty-five or thirty minutes.

With the object of obviating these irregularities and fluctuations, I employ a high-pressure gas capable of working up to 160 inches of water. High-pressure lighting has a limit of about 60 inches water pressure. The air supply is at atmospheric pressure in both cases. [The author here described by the aid of a diagram the valve arrangements for maintaining constant pressures notwithstanding the number of appliances in use.] A rotary exhauster and compressor draws the gas from the mains, and supplies it at any desired constant pressure to the burners—surplus gas being returned; and therefore not interfering with the pressure as delivered from the burner-nozzles, nor is it registered again in the meter. Variation of pressure in the mains has no effect. Until gas is supplied from the gas-works at high-pressure, small compressing apparatus similar to this [the example exhibited] is necessary if high-pressure gas is to be employed for heating. Although some towns have high-pressure gas-mains, the gas is not used at high pressure for heating, but for the convenience of distribution. Dr. Davidson, the Chief Chemist to the Birmingham Corporation Gas Department, and Mr. Barrett, the Lighting Superintendent, are pretty alive to this matter of heating; and a high-pressure main is now being installed in the city.

Describing a small plant for laboratory work, Mr. Onslow said: Assuming the maximum consumption of gas is 500 cubic feet per hour, and a pressure of 100 inches sufficient to meet all requirements, the valve acts directly the machine is put to work. If 300 cubic feet of gas are used, the surplus 200 feet are bye-passed back into the inlet-main. The pressure is a constant one whatever the consumption. The gas-pipe need only be one-half the usual size, or half the size of the compressor outlet. The inlet-pipe to the compressor should be full size. Having fixed the compressor, any temperature can be obtained by simply opening the gas-tap. Assuming that the highest temperature required is 2600° Fahr., a pressure of 100 inches would suffice. Supposing the use of four furnaces, in which different temperatures are required. The first furnace is to be heated to 2600° Fahr.; and the gas would be taken directly from the standard pipe. The second furnace requires 2000° Fahr., 70 inches pressure will suffice; and this can be obtained by a reducing-tap or governor, and the use of a pressure-gauge. In the third furnace, a temperature of 1000° Fahr. is required; and for this a pressure of 35 inches will suffice. The fourth furnace may be for melting lead; and for this 16 to 20 inches pressure is sufficient. Under similar conditions, the same temperatures will be obtained in the same time daily; and after the burners have been once adjusted, there will be the same consumption of gas. Quantities of about ½ lb. of copper have been melted in six-and-a-half minutes, and re-melted in less time. Suppose the copper is put in the day after, it will be melted and, if required, re-melted in precisely similar times. If larger quantities have to be dealt with, all that has to be done is to turn on a second or third burner, as I do not recommend interfering with the standard pressure.

It is generally found better to maintain the standard pressure high enough for the particular purpose without constantly raising or lowering it. The pressures must be suited to the work. For instance, it is possible to soften the ordinary plumbago crucibles in thirty minutes with 100 inches pressure. But there are cases where the pressure has necessarily to be either raised or lowered. In glass manufacture, 10 to 20 cwt. crucibles should be treated at 60 inches pressure for twelve hours to melt the composition; a pressure of 90 inches for six hours is required to refine the glass, followed by a drop to 40 inches for emptying. Only the cost of town gas has prevented the adoption of this system generally. If gas could be supplied at 1s. 3d. per 1000 cubic feet, glass could be made more cheaply by it than by coke at 15s. a ton. The use of blue water gas made on the Kramer and Aarts system, and worked at high pressure, would result in glass manufacture being cheaper than by coke. I mention this particular system here because the gas has the highest calorific value among such gases; and is about half that of ordinary town gas. For melting lead in cast-iron pots, 20 inches pressure is quite sufficient. To temper long steel bars, axle trees, &c., they are suspended vertically, and heated at 60 inches pressure for thirty minutes, at the expiration of which time the burners are shut off for five minutes to allow the temperature to equalize. Tempering, case-hardening, and annealing furnaces need not have large combustion chambers. There is a division in each furnace down the centre, so that the gas is confined to each side, and so closely is the heat exerted that furnaces can be equally heated all over without 10° Fahr. difference in any part. It is quite possible with these methods of restricting the air and the gas to reduce the consumption from 600 to 200 cubic feet. Warming plates, instead of consuming 180 cubic feet per hour, now consume 25 feet. Metal melting-pots, demanding one-and-a-half hours to melt with gas at 80 feet per hour, now require gas at the rate of only 45 feet per hour, and melt in 25 minutes; and then the gas is closed down to 25 feet per hour.

With regard to the warming of buildings, if the highly heated products of combustion are carried in a metallic flue-pipe passing through a room for a sufficient distance, nearly all the heat generated may be rendered available for warming the room. With an ordinary gas-fire, this can only be done to a limited extent, because the fire will not draw, owing to the cooled gases having little or no ascending power; and there is also the objection that an unlined metallic flue will become dangerously hot at its base. It is therefore desirable to give the flue gases momentum, so that one part of the flue is not unduly heated above another. In order to accomplish this, Colonel Bagnold conceived the idea that, given sufficient initial pressure either in the gas or air supply, the injector-like action of the high-pressure burner would effect this. Experiments had demonstrated the soundness of the theory. With two high-pressure burners fed with gas at 60 inches pressure, a room of 750 superficial floor space has been heated 30° Fahr. above the outside temperature, with a gas consumption of 80 cubic feet per hour. Outside the building is a small combustion chamber lined with fire-bricks, in which are the burners. From here a steel flue is led through the wall and around the room, and again through the wall to the outer air. On leaving the heating chamber (which reaches a temperature of 2000° Fahr.), the flue passes through a boiler, from which are led water-circulating pipes; and thus part of the room is heated by hot water and part by the hot flue pipe. The gas passes out of the flue-pipe only slightly warmer than the air in the room. The installation has been in use for six months, and has given no trouble whatever. Its efficiency is about 90 per cent.

The objects I have had in view in all my experiments in high-pressure gas heating has been to simplify our present system of gas heating, and by obtaining a higher efficiency and effective flame control to ensure definite results. Temperatures in furnaces or crucibles can be controlled to a nicety. By maintaining a pressure at an absolutely straight line, we get something definite instead of problematical. It is merely necessary to open or close a gas-tap, and wait with confidence for the result. The improvements, displacing uncertainties of the past, and giving better heating results, naturally tend towards economy and a lower cost of production—an end which is furthered by using smaller combustion chambers and the simplification of installations. In the gas industry, we know that the man who designs a furnace is not the man who will have to use it; and if highly-skilled men cannot be employed, it is better that the gas industry should take the matter in hand, and give something that will render more positive results. With the furnaces we have now, and gas at definite pressures, I can absolutely say that if we want (say) 1000° Fahr. over two hours or any other period, it can be obtained and maintained, and at all times. I think we must do something, because I believe a great deal of harm has been done through useless methods of furnace heating that seem almost incomprehensible.

[Mr. Onslow had on view a small compressing plant for working by hand; and with this—although the supply of gas was not plentiful—he demonstrated the action of both the heating and lighting burners. He also showed models of furnaces.]

Discussion.

Colonel Bagnold, C.B., R.E., remarked that a great deal had been achieved at the Woolwich Arsenal by the use of high-pressure gas, of which Mr. Onslow was one of the apostles. He had worked at the utilization of high-pressure gas most assiduously for both lighting and heating, and had attained useful results—results which had been continuous and reproduceable, and had realized a considerable amount of economy. He (Colonel Bagnold) had a great belief in the future of high-pressure gas for heating purposes. In his opinion, the present system of using gas for the heating of houses was extremely wasteful and most uneconomical. Too much of the heat was wasted up the chimney. If they could have high-pressure gas laid on to their houses, they could heat them at a fraction of the cost at which they were now

heated. The injector action of the high-pressure gas-burner put a forced draught at their disposal; and the products of combustion could be forced long distances until one had practically exhausted the useful heat out of them. For heating large masses of metal and other things, high-pressure burners were invaluable. The only objection to lighting by the high-pressure system seemed to be that it was accompanied by a certain amount of noise. For use in private houses, therefore, it might not be altogether suitable. But for workshop and factory lighting, he thought his friend (Colonel Barlow) would agree with him that electric lighting was not in it with high-pressure gas lighting.

Dr. W. R. Hodgkinson had hoped Mr. Onslow would have been able to show the effect of this high-pressure gas better than had been possible, as he had no doubt many of the members had not seen the pressure gas at work. Unfortunately, it appeared that the gas supply of Burlington House was of very low pressure. It was worse than it was at Woolwich [laughter]; and so it had not come out at all well in the demonstration. He had an installation of high-pressure gas in his laboratory. It consisted of 3 H.P. motor and a compressing machine; and it really worked beautifully. He obtained all the gas he required for his work; and he could fully corroborate what Mr. Onslow had said about the maintenance of the temperatures. He could maintain temperatures in his little furnaces within 2° or 3° C. throughout a day. He could build up a little furnace suitable for a small crucible, or a furnace to any size—he had some built up to melt 40 lbs. of brass. Such furnaces, for use with high-pressure gas, could be built up with a little fire-clay and some fire-bricks in a few minutes. He could start with the clay wet—in fact, he always started with it wet; and the clay burnt with a sort of glaze over the front surface, and so did not crack. He had one now that had been in use for eight months. It had done a considerable amount of work, and was perfectly sound, although he started it to work five minutes after it was moulded. The only disadvantage (he knew he was rather sensitive) was the disagreeable noise the burners made. When they were in use, he had to shut all the doors to confine the noise within the laboratory. This was the only disadvantage of which he knew. The air supply could be regulated to a nicety. They could set a furnace going, get the temperature required, and leave it the whole day, with confidence as to a constant temperature being maintained. It far exceeded anything he had expected from it when Mr. Onslow first brought it to his notice.

The Chairman (Dr. J. Lewkowitsch) asked whether Mr. Onslow had considered the advisability of introducing into houses at high pressure gas containing 30 per cent. of carbon monoxide.

Dr. W. B. Davidson (Birmingham) remarked that in the gas industry there was a great deal of brotherly love which one did not often find in other industries. They tried to help each other as much as possible. From Birmingham they had applied to Mr. Onslow for advice, and he had kindly helped them. Now they were very busy there trying to do what they could with high-pressure gas for the purposes of annealing, melting, case-hardening, brazing, and such like, especially for the jewellers' quarter. They were laying a 4-inch high-pressure main, which would be used partly for lighting and partly for heating. They had carried out a great many experiments already; but he was sorry he could not give any results, as they were not so far advanced as he should like to be. He desired to corroborate what Mr. Onslow had said with regard to the economy of high-pressure gas. There was great economy indeed. He should think there was a saving of at least 60 per cent. They could melt 10 lbs. of copper for less than 1d., with gas at 1s. 6d. per 1000 cubic feet. The other great feature was the uniformity of the temperature. If one worked with a high-speed concentric blast-furnace, unless one stood by with a pyrometer and read the temperature every five minutes, one might be there night and day, and not get the temperature wished for. It was necessary to keep on reading the pyrometer; otherwise there was a drop in temperature, instead of a rise. With regard to carbon monoxide in gas, many chemists who were not connected with the gas industry were very much prejudiced against gas-fires and such like. He was sure it was indeed prejudice. Recent experiments at the Leeds University had shown that the carbon monoxide even in the flue gases was only 8 or 10 parts per million. Carbon monoxide was rather like some of the other scares of which they heard so much. It was only in pure water gas there was anything like 30 per cent. of carbon monoxide. In Birmingham, they ran at about 10 per cent. Certainly there was danger with leakage; and no doubt, as the Chairman had hinted, it would be rather a serious matter with a high-pressure service.

Mr. E. Grant Hooper (London) said he took it they might look forward to the day when they would have mains from the gas-works supplying high-pressure gas. Was Mr. Onslow acquainted with what might be called the individual application of the high-pressure system? And what class of motor was used for compressing the gas in such a case? Was there a small motor on the market that would be applicable for laboratories where assays were carried on?

Mr. T. H. L. Girtin (London) said he was interested in the melting of gold and silver residues and gold and silver bullion itself. He had lately taken up the melting of gold and silver bullion by high-pressure gas, and could corroborate the advantages claimed for it. Gas had been used very frequently before for melting bullion—chiefly in America. But there the air was generally put under pressure, and not the gas; and the result was they had a high velocity for the burnt gases which threw about considerably the volatilized gold and silver, and made it difficult to collect. It was a very important thing not to dissipate this film of gold and silver. In regard to cost, he had melted a great deal of gold and silver by coke, and had found that high-pressure gas was slightly more expensive. But the great advantage was that one had not the ash to contend with. After one had melted gold and silver by coke, there was as much as 10 per cent. of the ash to treat. He had had to treat in a year the ash of as much as 300 to 400 tons of coke. In his work, he only used the moderate pressure of about 12 to 14 inches of water; and he found no noise whatever.

Colonel Sir Hilary Barlow (Woolwich Arsenal) remarked that he used furnaces heated by high-pressure gas for the annealing of shell, and for other treatment before hardening. A very accurate temperature came in enormously in the case of projectiles, because it was no exaggeration to say that for certain steels a difference of only 60° C. meant either good results or exceedingly bad ones. It was a little wandering from the subject perhaps to say that a modern armour-piercing projectile was called upon to do very heavy work. Taking a 12-inch armour-piercing shell, to-day it must pierce 12 inches of Krupp's steel, with hardened face and tough back, and come out of the other side unbroken. If they liked to calculate out the class of energy and class of density wanted to do this, it would be seen that it was a tough problem they had to face; and the problem could only be solved with certain steels within a temperature variation of 50° Fahr. On either side of this, there would be failure. It would be understood from this what an enormous value there was in a furnace that could be trusted. He did not say that in all cases he used this high-pressure type of furnace; but for the larger shell he did. For ordinary shell, he was content with the ordinary annealing furnace using coal or coke; but it had to be carefully watched. Colonel Bagnold had mentioned the use of high-pressure gas for lighting. He (Sir Hilary) would never dream of putting in electric light now for lighting factories. With these high-pressure burners for lighting workshops, there was absolutely no comparison. Many people who had been round the shops in the winter time, where he had high-pressure lighting in use, had afterwards written to him to ask how it was done. He would now no more think of putting in arc lights than think of flying. High-pressure gas gave a beautiful, steady, and perfect light.

The Chairman asked if producer gas could be used with this apparatus for lighting purposes.

Dr. Harold G. Colman (London) said he might perhaps say, with regard to the Chairman's question, that it would not be possible to get such good lighting with poor gas like producer gas as with ordinary coal gas. With producer gas, owing to the 50 to 70 per cent. of inert gases that it contained, the high temperature obtainable with coal gas could not be realized. He was sorry there was not time for further discussion.

Mr. Onslow, in reply, said that unfortunately he had not much to answer. With regard to the inquiry as to small installations, the results he had given in his paper were from some hundreds of experiments. He could not possibly go into details over the whole of the system, and had only supplied a general outline. They had small installations of compressor driving—for instance, for soldering-irons. They employed a $\frac{1}{8}$ H.P. electric motor, with 500 cubic feet per hour. With this they could do anything they liked. The system was adaptable to any particular purpose. With regard to Mr. Girtin's remarks as to melting gold and silver, he was one of the gentlemen with whom he should like to have a serious talk. At present, he was not sure whether this gentleman and himself were agreed as to the correctness of his method of heating. He should rather fancy they were not. In his (Mr. Onslow's) opinion, gas properly applied in suitable furnaces was cheaper than coke. He had found it so in many cases; and the same applied to anthracite. He knew of one large printing-works that had adopted the high-pressure gas system of heating; and there it had been found to be cheaper than anthracite. Twelve burners were used with a four-ton pot. The pressure was always constant, and so was the temperature. As to producer or suction gas, Dr. Colman had answered that.

A hearty vote of thanks was accorded to Mr. Onslow for his interesting communication.

Last Saturday week Mr. Richard Forster, a former Mayor of Carlisle, died at his residence in the city. He entered the Town Council and distinguished himself as a member of the Gas and Water Committee, of which he was Vice-Chairman and Chairman for seventeen years before he was elected Mayor in 1889. He continued to serve on the Gas Committee for some years afterwards. He had of late been living in retirement.

In the course of the Inaugural Address delivered by Dr. George Beilby, F.R.S., at the thirty-second annual general meeting of the Institute of Chemistry, on the 1st inst., he showed how the Institute had fulfilled the duties imposed upon it by the Royal Charter, by providing for the community a class of properly qualified professional men for public chemical appointments, for general practice, and in connection with industrial concerns. He said the diplomas of the Institute were generally recognized as the outward sign of sound professional training. The Institute had undoubtedly influenced the teaching of the universities and colleges, and had endeavoured to encourage the production of men who could not only talk about chemistry, but who were able to apply their knowledge usefully.

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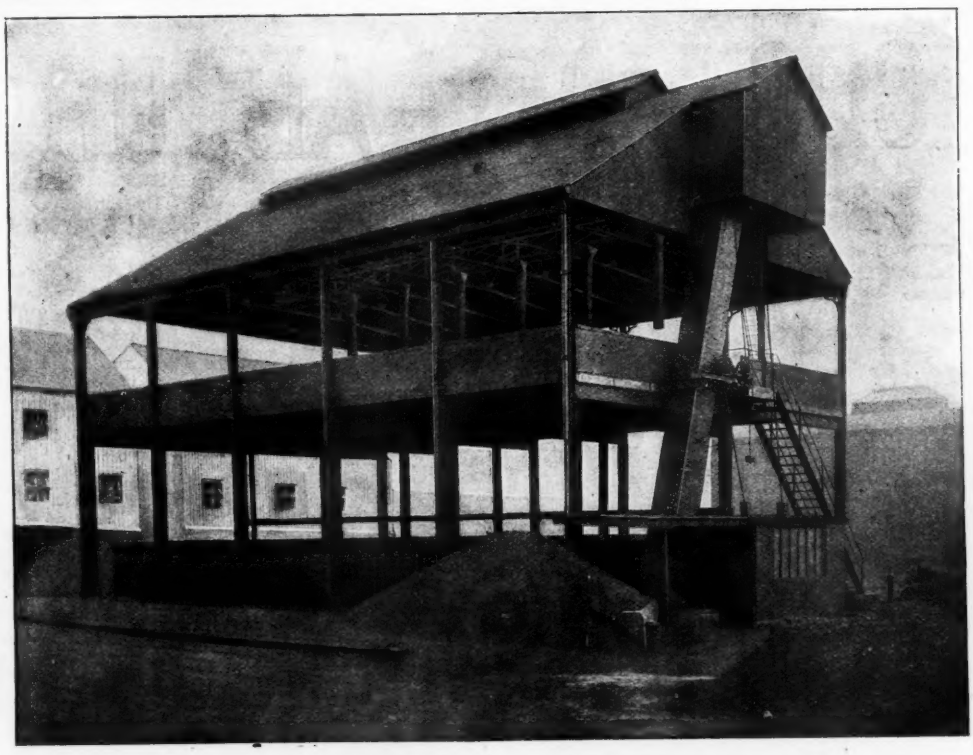

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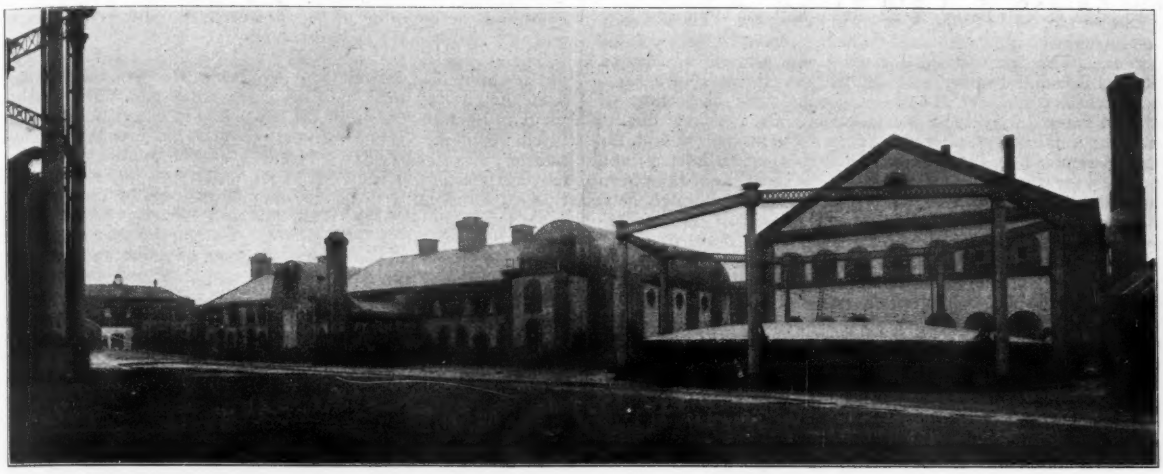
A VISIT TO THE HORNSEY GAS-WORKS

By the London and Southern District Junior Gas Association.

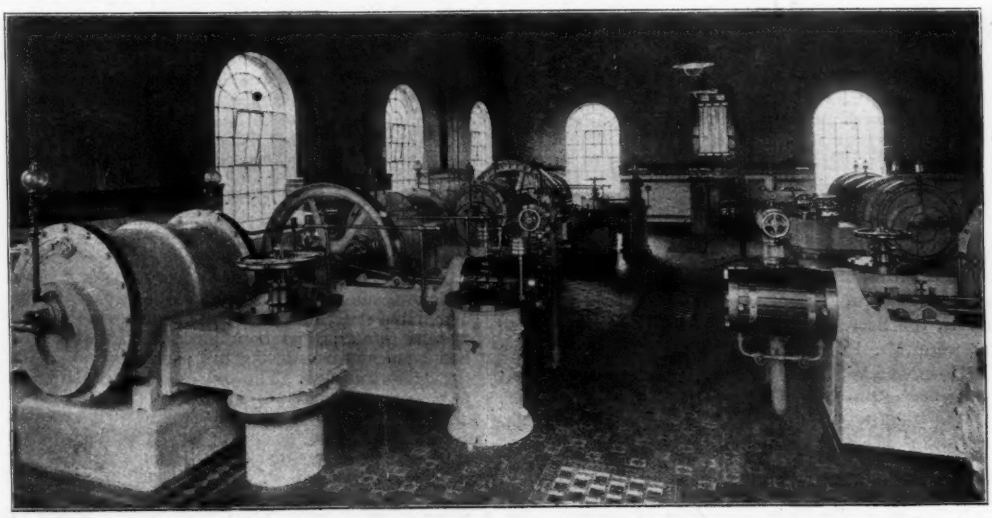


The Relief Holder, the Carburetted Water-Gas House, and Retort-House Nos. 1 and 2.

Last Saturday afternoon saw the fulfilment of an item in the programme of the London and Southern District Junior Gas Association which had been looked forward to by the members with the keenest enjoyment—to some extent on account of the unique features of the occasion that had been announced. Briefly, the function was a visit to the works of the Hornsey Gas Company; and the unique features were the invitation extended by the Engineer and General Manager (Mr. J. W. Buckley) to ladies to join the party, and a musical entertainment provided at the close of the inspection. But great as was the enjoyment of anticipation, it did not, in this case at any rate, exceed that of realization; for the afternoon was a thoroughly successful one in all respects. This was only to have been expected, however, seeing that everything possible had been done by the hosts to secure the comfort and convenience of the visitors. The cleanliness, roominess, and pleasant situation of the works render them admirable for the purpose of instructing ladies in the science and practice of gas manufacture; and, in addition to this, the district is one that is easily "get-at-able." Under these circumstances, it was not surprising to find that—headed by the President (Mr. W. J. Liberty)—there was a muster of about 130 at the hour appointed to begin the inspection, in spite of the inclemency of the weather. The arduousness of the task of those who acted as guides (Mr. J. W. Buckley, Mr. F. Mitchell, Assistant Engineer, Mr. W. H. Owen, Mr. H. E. Ratcliffe, Mr. Kenneth Sproxton, and Mr. Oreno, Chief Collector), was, it should be mentioned, greatly minimized by the distribution of a nicely got-up little booklet giving a brief account of the works.

The Hornsey Gas Company is not, of course, a new undertaking. The date of its establishment is 1857; and incorporation by Special Act of Parliament took place in 1866. The district comprised within the Borough of Hornsey (which includes Harringay, Crouch End, Muswell Hill, Fortis Green, part of Highgate, and a detached portion of the parish of Clerkenwell) is one that is growingly sought after for residential purposes, with a consequent steady increase in the demand for gas. The satisfactory condition of affairs that exists in this respect will be gathered from the fact that, whereas the make of gas in the year 1900 was 331,500,000 cubic feet, in 1909 it was 496,818,000 cubic feet. There is municipal electrical competition; but with the exception of two streets, all the street lighting is done by means of gas, which is consumed by the Council (who make themselves entirely responsible for the public lighting) chiefly through inverted burners. Apparently municipal electricity in Hornsey has proved to be as little of a gold mine as has been the case in some other places; for, if we remember rightly, it was necessary on one or two occasions to draw upon the rates in connection with the undertaking. While on the subject of outside lighting, it may be mentioned that there are in different parts of the Company's district several installations (one with 62 lamps of 1000 and 600 candle power) of high-pressure gas, on the Keith-Blackman system for the lighting of small groups of shops. This arrangement is giving satisfaction at Hornsey, as it has done elsewhere.

To come to the works themselves, it may be remarked that the first thing that strikes one is the scrupulously clean condition of the place generally; and the next, is the extensive area of ground available, which is amply sufficient, not only for present requirements, but to cope with a very largely increased demand. It is pleasant to turn the eye from the gas plant on one side, to the extensive workmen's garden allotments and bowling green on the other. Work and pleasure are certainly intimately combined on the ground of the Hornsey Gas Company. The works are adjacent to the main line of the Great Northern Railway, which runs along a high embankment. Three separate sidings bring the coal directly into the three coal-stores adjoining the retort-houses. The floors of these stores are on a level with the yard; while the rails are 27 feet above. As tip-bottom waggons are used, the arrangement is an excellent one for getting the coal



View of the Exhausting Plant.

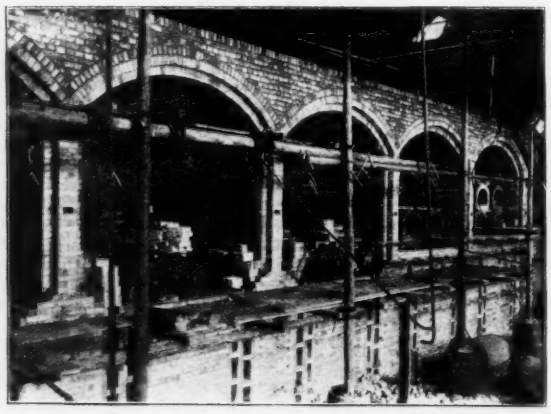
from the waggons and storing it with a minimum of labour. With regard to the coke, this is removed in buggies, which run on rails, to a hydraulic crane, by means of which it is raised to the level of the railway for loading into waggons.

Turning to the retort-houses, the one which is most interesting is No. 2, which contains five through beds of nine retorts (each 23 in. by 16 in. by 20 ft. long), or 90 mouthpieces. These are of the regenerative type, with modern fittings, &c., and were erected last year. The contract for the work was secured by Messrs. Gibbons Bros., of Dudley, who carried out the work in a rapid and successful manner. The photographs show the settings at different dates during their construction. These enable one to see what quick progress was made. As a matter of fact, the work of demolishing the old settings was begun on April 7; and by June 5 the whole of the brickwork of the new benches had been completed. At present, No. 1 house contains ten through beds of seven retorts (22 in. by 16 in. by 20 ft. long), or 140 mouthpieces. They are of the direct-fired type; but there is a probability of their being replaced during this year by nine through beds of nine retorts (23 in. by 16 in. by 20 ft. long), or 162 mouthpieces. These will be on the regenerative principle, with modern fittings, hydraulic mains, retort-house governors, and tar-towers. When this work has been carried out, the maximum make of the two houses will be about 2 million cubic feet per day. A third house has not yet been completed. The charging is all done by hand—six-hour charges in the new, and eight-hour in the old house. The coal that is being used just now is from Yorkshire and Durham. It will be observed that the combined producing capacity of the coal and carburetted water-gas plants will be equivalent to 4 millions per diem.

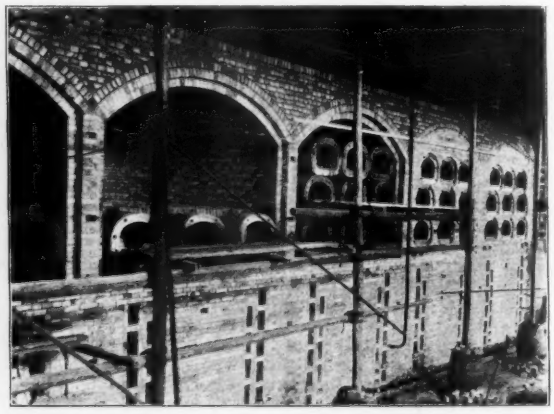
Conspicuously clean and orderly in a works that are throughout notable for their cleanliness, is the carburetted water-gas house—a capacious building in which there are four sets having a combined capacity of over 2 million cubic feet a day. The engines and blowers, however, are only sufficient for working two sets at a time. At present, the coke for the water-gas plants is raised by hydraulic crane nearly to the top of the house and then dropped down shoots for loading into the barrows; but a start is about to be made with the erection of an overhead coke-hopper which will run right along one end wall of the house, and will have eight or ten outlets. This will facilitate storage of the coke and the handling of it. The carburetted water gas passes from the plant to a small relief holder.

The exhausting plants for both coal gas and carburetted water gas are housed under one roof; but each is connected to 18-inch yard mains, and deals with the gases separately. The coal gas plant is in duplicate, each set consisting of a horizontal engine, fitted with one 80,000 and one 60,000 cubic feet per hour exhauster. The water-gas exhausters are in duplicate also; the capacities being 50,000 and 30,000 cubic feet per hour respectively. Adjoining are the station meters—one for coal gas, the other for water gas, and each having a capacity of 80,000 cubic feet per hour. At the outlets of the meters, the two gases combine, and pass forward to the gasholders, of which there are two—one of 850,000 and the other of 360,000 cubic feet capacity, thus giving a total storage of 1,210,000 cubic feet. In the coal-gas meter house, are installed the station-governors from which the gas passes to the district through two mains, one 30-inch and the other 18-inch. On these mains is fixed a "Simplex" carburettor. This apparatus is not used as an enricher in the strict sense of the word; the object of it being to volatilize ordinary paraffin into the gas, or, in other words, to increase the amount of vapours of naphthalene solvents.

As to the washing and scrubbing arrangements, these include a tar-extracting washer and a naphthalene extractor. There is also a "Standard" washer-scrubber of a capacity of 2 million cubic feet a day. There are two complete sets of purifiers, one for coal gas and the other for carburetted water gas. Each set consists of four cast-iron boxes of the ordinary lute type, fixed in line, with an 18-inch centre-valve between the two centre boxes.



May 10, 1909—Completion of the Arches.



A Week Later—Building-in the Retorts.

The New Settings in Course of Construction.

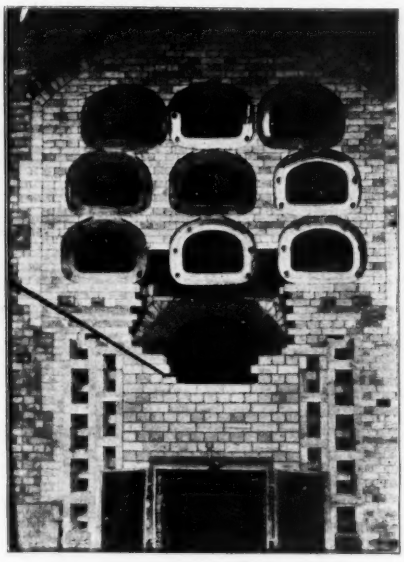
The boxes are 25 ft. by 25 ft. by 5 ft. The full length of one side of each of the sets is covered by a shed 137 ft. by 21 ft. 9 in. Oxide of iron is employed for purification.

The offices, which are situated at the entrance of the works, are substantial and commodious. Clerks' offices are on the ground floor on either side of the gateway; and there is also an inspectors' room, in which each inspector is provided with his own desk. Passing upstairs, there are the Engineer's office, an excellent lecture room, a large, well-lighted drawing-office, and capacious stores and show-rooms. There is also a comfortable tea-room for the staff, and a well-fitted photometer-room. The Company have, in addition to this, an admirably arranged show-room at Crouch End, with an office for the collectors.

Mr. Buckley has only been at Hornsey some fifteen months; but already there are plenty of evidences of his activity to be seen. With an increasing consumption such as the Company are experiencing, there should be full scope for his energy for a long time to come.

On the completion of the inspection, the large party assembled in the stores for refreshments; and this pleasant function was followed by a musical programme, which was arranged by Mr. W. E. Roberts, the Secretary to the Company. Among those taking part were Mr. H. Ratcliffe, Chemist; Messrs. Tasker Speed, J. T. Horn, and W. Gowing, of the Clerical Department; Mr. George Barker, of the Rental Department; and Mr. Roberts. A number of old English glees were sung by the first four gentlemen, which were thoroughly enjoyed by the audience.

Mr. Buckley, then, on behalf of the Directors of the Company, extended to the visitors a hearty welcome to the works, of which, he remarked, they were already in possession of a concise description, and which they had also had an opportunity of thoroughly inspecting. It was for them to say whether they were pleased or displeased with their visit to Hornsey. It seemed rather opportune for him to mention at this point that, when the negotiations were proceeding for the visit, one or more members of the Committee of the Association approached him as to the desirability or otherwise of the attendance of lady friends of the members on the occasion. He at once replied that he personally had no objection at all; but he felt he would like to hear what inducement there would be for the ladies to come up to Hornsey, while they did not go to the other works that had been visited. The answer he received was that some of them believed the Hornsey works to be one of the cleanest in the country. With regard to this statement, it would not become him to say whether it was true or not true. The members had seen the works; and they were in a position to judge for themselves. The immediate past twelve months had been an exceedingly busy time for the Company; and perhaps it might not be out of place to quote a few figures to show what had been done. The interior of No. 2 retort-house had been reconstructed; and the rapid and satisfactory manner in which the contract had been performed reflected the greatest possible credit upon the Contractors, Messrs. Gibbons Bros., of Dudley. They commenced on April 7 to take down six through beds of seven retorts, or 84 mouthpieces; and by June 5 they had completed the whole of the brickwork appertaining to five beds of nine retorts, or 90 mouthpieces. The whole of these retorts had been at work during the past winter, and had given most satisfactory results. The old exhausting plant was re-arranged in the present house; and two duplicate sets, especially for water gas, were erected, capable of dealing with a production of about 2 million cubic feet per day. Then, parallel with the purifiers two sheds had been erected for the oxide of iron. A station meter, to pass about 2 million cubic feet of gas per day, had been installed for separately measuring the carburetted water gas; and other minor alterations had taken place. While a busy time had thus been spent on the works, things had been equally active on the district. There could be no possible comparison between the



May 24, 1909—Waiting for the Mouthpieces.

A Sample Setting and Fittings.

attention now given to a gas company's district and what it was twenty-five years ago. Even twelve months back at Hornsey, there were only 21 superintendents, fitters, and boys in the Company's employ; while the number was 67 now. This went to show the intention of the Directors to be progressive and up-to-date. They were determined to do—and, in fact, were doing—everything reasonable to popularize the commodity which they had for disposal. They were not only willing but anxious at all times to give the best possible advice to the consumers, and even do small things free of charge. Some idea of the amount of work accomplished on the district during the past twelve months would be gathered from the following figures. There were 2899 yards of new mains laid, and 544 service-pipes. The net gain of consumers was: Ordinary, 247; and prepayment, 885. Then, the number of cookers fixed was 1424. With regard to the slot-installation work, he might mention that the whole of it was undertaken by the Company's own employees; and consequently everything was under their direct supervision. The Directors were equally alive to the different times in which their officers and workmen were living, as compared with years ago. For the benefit of the fitters and the outdoor department, they had arranged for the scientific side of their work to be demonstrated by a competent lecturer once a week on the Company's premises; and the past winter's experience of these lectures proved that they were very much appreciated both by the staff and the workmen. The Board had also provided a commodious tea-room for the staff; while the stokers' comforts had not been neglected, as they were well provided with mess, wash, and bath rooms. For the benefit of the workmen, too, garden allotments had been arranged; and 2 or 3 acres of ground had been levelled, and an exceedingly nice grass plot made, on which the officials and workmen might indulge in cricket, bowls, or tennis. With regard to the public lighting, some few words of praise were well deserved. Though it was carried out by the municipal authorities, it was done in a really excellent manner; and certainly what might be called up-to-date street gas lighting was employed. They generally adopted the modern system of inverted gas-burners; and, what was equally important, they kept them in first-rate condition. While he believed it was the proud boast of Hornsey to be one of the healthiest towns in Great Britain, the municipal authorities, on their part, claimed, with some amount of truth, that it was also one of the best lighted. He must congratulate the members of the Association on living in the present enlightened age. He could remember twenty-five years or more ago, when they would not perhaps have been as well received in the different works they visited as was the case now. He could recall an occasion when a certain foreman refused him admission to the photometer-room. Happily, these days were past; and, within reason, he believed that those in responsible charge would offer every facility for what might be known as the junior branch of the profession furthering their knowledge of the industry in which it had been their lot to be cast. He did not intend to detain his hearers much longer; but it just occurred to him that he might offer one or two words of advice to those who might within the near future be placed in responsible charge of a gas-works. The first thing to be done on taking charge of a works was to see that everything was well organized. The second was to see that the works were kept clean. The third was to see that every building, piece of apparatus, or section of plant was capable of meeting the maximum demand, or to find out the reason why not. The fourth was to see that the assistants, the foremen, and the workmen were able to perform the duties they were engaged on, and, further, to ascertain that they received the maximum amount of pay that might be given in the district. In conclusion, he would venture to express the hope that the members would retain a pleasant recollection of their visit to the Hornsey Gas-Works, which some of those present were proud to be associated with.

The PRESIDENT said they were very pleased to be there that afternoon, making the acquaintance of the Hornsey Gas-Works. This was not the largest works they had visited; but it was certainly one of the cleanest and most orderly. He was glad to note that their progress in output (it had increased from 331 millions to 497 millions in nine years) was continuous, and that the same applied to the public lighting. There was no set-back there; the number of public lamps having increased in two years from 1579 to 1599. Then he was pleased to observe they had gone in for outside shop lighting by high-pressure gas, and also that they were "alive to the times" and not afraid to do small things free of charge. There were evident signs of good organization on all hands. They were reminded that this was one of the early works to adopt carburetted water gas—viz., in 1895. The educational and scientific side of the staff was not neglected; and the lectures provided for the staff and workmen were appreciated. This appealed to him very much. He could assure Mr. Buckley that his words of advice that afternoon to those who would in the near future be taking upon themselves responsible positions in charge of works would not fall upon deaf ears, but would bear fruit. He was glad Mr. Buckley was no party to the "closed door" system that might have prevailed many years since. His experience as a leader among "juniors" was that throughout the country "open doors" was now the order for Junior Associations; and in his opinion it would be a sad day for the industry if young men, full of zeal and energy, desirous of obtaining knowledge that they could afterwards bring into practical use in their daily calling, were barred from entrance into the works. He did not believe, from his happy knowledge of the gas engineers of the present day, that such a thing would ever obtain. In conclusion, he trusted that the 2 acres of playing fields would soon be appropriated for further extensions. He foresaw a great future for the Hornsey Company.

Mr. L. F. TOOTH (Senior Vice-President) said it had given him a great deal of pleasure to be present that afternoon. He was particularly struck with the exhauster-house; it being, in his opinion, one that any works in the country might be proud of.

Mr. D. W. WINSLOW moved that a hearty vote of thanks be given to Mr. Buckley for his kindness in throwing open the works that afternoon and giving his personal guidance. What he had seen had given him the impression that everything was carried on at a high pitch of organization. He was particularly struck with the cleanliness and method everywhere, and noticed the ease with which the coal was brought into the works from the Great Northern Railway adjoining, and dropped through the bottom of the trucks into the retort-house—thus obviating the necessity of hand or machine labour.

Mr. F. AINSWORTH seconded the resolution, and included the kind hospitality they had received.

The resolution, with which Mr. Roberts's name was coupled, was carried with acclamation.

After the concert, Mr. BUCKLEY moved a vote of thanks to Mr. Roberts and the members of the staff who had provided such an excellent programme.

The PRESIDENT seconded the vote, which was heartily accorded, and acknowledged by Mr. ROBERTS.

On Thursday Mr. J. H. Troughton's year of office as W.M. of the Etheldreda Lodge, No. 2107, Newmarket, will be completed by his installing Bro. Charles Waugh as his successor.

MIDLAND JUNIOR GAS ASSOCIATION.

Fifth Annual Meeting.

The Fifth Annual General Meeting of the Midland Junior Gas Engineering Association was held at the City of Birmingham Technical School, Suffolk Street, last Saturday afternoon—Mr. A. O. Jones, of West Bromwich, the President, in the chair. Two of the honorary members—Mr. B. W. Smith (Walsall) and Mr. H. E. Copp (West Bromwich)—who attended the meeting, were accorded a hearty welcome.

The Report and Balance-Sheet.

The Hon. Secretary (Mr. H. E. Temple) read the report of the Council and the balance-sheet. The former stated that at the present time there were 133 ordinary members of the Association, as compared with 140, 132, 120, and 110 respectively for the four previous sessions. Resignations had been received from 10 members; and 17 had retired from membership under the provisions of Rule 6. The new members elected during the present session numbered 18. The programme had, as far as possible, been carried out as arranged; and the Association were greatly indebted to the President for an able and interesting address, and to the readers of papers for the high standard of the technical matter that had been presented, and which had always given rise to well-sustained discussions. The visit to Beckton was greatly appreciated and enjoyed by those members who were able to be present; and the sincere thanks of the Association were tendered to the Directors of the Gaslight and Coke Company, who extended the invitation and their hospitality, and also to Mr. J. N. Reeson and those members of his staff who conducted parties round the works. In the afternoon, by permission of Mr. W. J. Liberty, and under his guidance, the subways of the City of London, used for the distributing mains of gas, water, and electricity, were explored and inspected. The Association were also greatly indebted to Mr. Fletcher W. Stevenson and to the Directors of Messrs. Hardman Limited, for the facilities afforded to visit the respective works, and for the generous hospitality extended to them, as well as to the Sutherland Meter Company, Limited, whose works the members would have an opportunity of visiting next month. The Council wished to place on record their sensibility of the great loss the Association had sustained by the death of Mr. George Hampton Barber, an honorary member, who always had the interests of the Association at heart. The President attended the annual meeting of the Midland Association of Gas Managers on the 3rd inst., when certain alterations of the rules were under consideration, one of which was for the inclusion of associate members, and read as follows: "Associate members shall be persons who, by reason of their professional knowledge or experience, are, in the opinion of the Committee, qualified to assist in promoting the objects of the Association, and who shall not be engaged in trade." The Council were of the opinion that this rule, as worded, was likely to affect the membership of their Association, and suggested that the Senior Council be approached with a view to receiving a deputation from the Junior Association to obtain further information and to discuss the matter. The statement of accounts prepared by the Hon. Secretary, and audited by Mr. J. H. Hardy, showed that the financial position of the Association continued to be most satisfactory; the balance in hand being practically £34.

The adoption of the report and accounts was proposed by Mr. R. S. Ramsden (Burton-on-Trent), seconded by Mr. F. J. Ward (Knowle), and agreed to.

Proposed Associate Member Rule of Senior Association.

The President, referring to the report, said it was thought by the Council that the wording of the proposed rule for the inclusion of associate members in the Midland Senior Association might affect their Association, as members might naturally prefer to read papers before the seniors rather than submit them to the juniors. They were therefore of opinion that they might approach the seniors, with a view to such alteration of the wording as would exclude juniors. When he attended the meeting, he was assured by the President that the rule was not intended to affect the Junior Association, but was meant to apply to men of eminence in the profession. The question was whether the wording could be so altered as to show what was intended.

Mr. Ward asked whether the Council had anything in their minds with reference to what they meant to put before the Senior Association.

The President replied that in the first place they would have to see whether the deputation would be received. When they knew this, it would be time to decide what to say. Perhaps an informal talk would reveal some way out of the difficulty.

The Hon. Secretary said it was felt by the Council that the qualification set forth in the rule was a little ambiguous; and the deputation would simply ask to be enlightened as to the meaning of the words. Then, of course, the matter could be still further considered.

Mr. Ward said he attended the last meeting of the seniors; and he was bound to say he came to the conclusion that the seniors themselves did not know what was intended.

Mr. H. E. Copp (West Bromwich) remarked that he must confess the last speaker had "hit the nail on the head." His own idea was that the associate membership should be purely complimentary, and should be conferred as a mark of appreciation on certain gentlemen whose services to the gas profession had been valuable. He thought there was no doubt the Junior Association would be rather premature in taking action before they had seen what the Senior Association intended to do in the matter. He was strongly against the idea of extending the membership of the Senior Association in any large degree, because he happened to be the over-burdened Hon. Secretary. At their meetings, they had an average attendance of between sixty and seventy. The Junior Association would, to his mind, be quite safe in leaving the matter until they saw precisely what the Senior Association intended to do. The rules were not yet accepted.

The President said Mr. Copp's remarks put the matter in a rather different light; and he agreed that that they might safely leave the matter over for the present, and see what the final proposal of the seniors would be.

Mr. Copp: Of course, my remarks are entirely without prejudice as regards the Senior Association. I should not like to compromise the action of the Association in any way; and I am speaking quite unofficially.

The President: Then perhaps it would be quite as well to have a deputation.

Mr. C. C. Barber (Nechells) suggested that they should wait and see what the seniors intended to do.

Mr. Copp: I think you may take it that in their final form the rules will not be ambiguous at all. They will not be finally accepted until the autumn.

Mr. Ramsden: Could we get over the difficulty for the present by writing to the Senior Association, saying we thank them for allowing us to consider the proposed alteration of the rules, and putting our case before them—adding that we shall take it as a favour if, in modifying their rules, they will arrange the wording so as not to deprive the Junior Association of its members?

Alteration of Rules.

The President said there were on the *agenda* two notices of proposed alterations in the rules. The first was with regard to the qualifications of members, the original Rule 4 was to include "any person holding a recognized official position engaged at a gas-works, &c.;" and the alteration was to "any person holding a position at a gas-works, &c." Persons holding more humble positions on works, if they felt sufficient interest in their work to join such an Association, should be encouraged. At present there was a difficulty in knowing where to draw the line. The second alteration was to Rule 6; and it was to the effect that the subscription should be 5s. per annum, to include a free copy of the "Transactions" for the current year. The change was proposed by the Council on account of the good balance-sheet.

Mr. Ward, in proposing the alteration to Rule 4, said he was decidedly of opinion that anyone having sufficient interest in the Association to pay up the subscription, and being engaged in a gas-works, &c., ought to be accepted as a member.

Mr. J. Hewett (Birmingham) seconded the proposal, and said they would welcome anyone who would come and take part in the discussions.

The motion was carried.

The alteration to Rule 6 was then agreed to, on the proposition of the President, seconded by the Hon. Secretary.

English Junior Associations Joint Council Meeting.

The President said the Secretary and he had just attended the Joint Council meeting in London. Among several things proposed, were two on which they desired to have the opinion of the members. He should say that nearly all the items on the *agenda* were left over for further information to be obtained. There was no voting that was binding in any way on the Association. One point raised was the transfer of members from one Association to another. If a member of one Association who had paid his subscription moved to another part of the country, he should have the option of joining the nearest Junior Association if he liked, without paying a further subscription. It would be a good thing. It met with the approval of the other delegates; but the confirmation of the members of this Association was needed of the vote given on their behalf. The only other resolution actually passed was that a joint conference of Junior Associations should be held in Birmingham in May of next year, and that the Secretary of the Midland Junior Association should see what arrangements could be made to entertain them, in the way of a gas exhibition or something of that nature. The question of printing the whole of the "Transactions" of the different Junior Associations in one volume was held over.

The action of the delegates was confirmed, on the motion of Mr. A. N. Comely (Windsor Street), seconded by Mr. R. J. Rogers (Birmingham); it being agreed to omit mention of a "gas exhibition" from the resolution.

Election of Officers.

The following officers were elected for next session.

President.—Mr. R. S. Ramsden (Burton-on-Trent).
Senior Vice-President.—Mr. H. E. Temple (Nechells).
Junior Vice-President.—Mr. R. J. Rogers (Birmingham).
Hon. Secretary and Treasurer.—Mr. G. C. Pearson (Birmingham).
Hon. Auditor.—Mr. J. H. Hardy (Coventry).
New Members of Council.—Mr. W. H. Johns (Saltley), Mr. F. J. Ward (Knowle), and Mr. C. C. Barber (Nechells).

COMPETITION AND THE DEVELOPMENT OF GAS SALES.

Mr. B. J. BELL (Birmingham) subsequently read a paper entitled "Competition and the Development of Gas Sales;" and this will be found on page 738. The report of the very lengthy discussion to which it gave rise is, owing to want of space in the present issue, left over until next week.

A vote of thanks was accorded to the author, on the motion of the PRESIDENT, seconded by Mr. W. S. SMART (Saltley).

MANCHESTER JUNIOR GAS ASSOCIATION.

Visit to Wigan.

The members of the Association paid a visit to Wigan on the 5th inst., and first inspected the Kirkless works of the Wigan Coal and Iron Company, and later in the day went through the gas-works of the Wigan Corporation.

On arrival at the railway station, the party were met by Mr. Betley, the Assistant-Engineer of the Wigan Gas-Works, and conveyed by special cars to the Kirkless works, where the coke-ovens, &c., are situated. Here they were heartily welcomed by Mr. Percy, the General Manager, and his staff (Messrs. Byrom, Christopher, and Mather), who, after dividing the party into groups, conducted them over the works, describing the plant and explaining the methods as they proceeded.

The extensive coke-works were first visited; the arrangements for elevating the washed slack and pressing it into huge cartridges of 5½ tons weight, being specially commended. The charging and discharging of the ovens was done for the benefit of the visitors. The carbonizing tank consists of three batteries, each containing 44 Semet-Solvay coke-ovens, which are capable of producing a weekly output of 3600 tons of hard, close-grained coke, made of washed and ground Arley slack. Each oven is 33 ft. by 6 ft. by 17 in., and burns off a charge of 5½ tons of slack in about 22 hours. The following is a percentage analysis of the coke: Ash, 10·94; sulphur, 1·40; volatile matter, 0·60; fixed carbon, 87·06. The excellent character of the coke was remarked upon by the visitors, who expressed the wish that they had such coke for their carburetted water-gas plants. The bye-products obtained per week are approximately: Sulphate of ammonia (24·8 per cent. NH_3) 48 tons; tar, 200 tons. Some of the coke-works liquor is worked up to concentrated ammoniacal liquor of 16 to 18 per cent. NH_3. The surplus gas, having a calorific value of about 500 B.Th.U. per cubic foot, is used, with the waste heat from the ovens, to generate steam for power plants. Enough steam is obtained in this way for the whole of the coking plant, sulphate making, power for the fitting-shop, saw-sheds, and pumps—the last dealing with a total of 2 million gallons per day.

The iron and steel works were next inspected, where the huge blast-furnaces, ten in number and 80 feet high, much impressed the visitors. Here are made the following varieties of metal: Basic pig iron, foundry and forge pig iron, spiegeleisen, silicon spiegel, ferro-silicon, and ferro-manganese. By the courtesy of Mr. Percy, a 50-ton charge was run off from a furnace for the members' benefit, during the inspection. As the stream of white-hot molten metal, at a temperature of 2200° Fahr., passed through the channels into a huge wheeled receptacle, the visitors could not refrain from showing their appreciation of such a spectacle, and of the kindness of Mr. Percy in providing it.

After the members had partaken of some refreshment,

Mr. HEALD (Preston) proposed that thanks be given to the firm and to Mr. Hewlett (the Managing-Director), for allowing the visit; also to Mr. Percy and his staff, for the able way in which they had described the various parts of the plant. He specially referred to the kindness and ability of their guides, two of whom (Mr. Byrom and Mr. Christopher) are joint authors of a treatise on coke-ovens.

Mr. MASSEY (Oldham) seconded the proposition.

Mr. D. V. HOLLINGWORTH (Salford), who took for the day the place of the President (Mr. J. Taylor), put the motion; and it was carried with applause.

Mr. PERCY, in reply, said he hoped the visitors would note that all the slack coal was used in the coke-ovens, and all the good coal sold to gas-works. Alluding to the observations of some of the members as to the good quality of the sulphate of ammonia, he said he had been asked if he had had a special "brew" for their benefit. He wished to say he had not. Every day's "brew" was special—specially good.

The party were then taken by tramcar to the gas-works, where the Engineer and Manager (Mr. J. Timmins, M.Inst.C.E.) cordially welcomed them, and, with his Assistant (Mr. Betley) conducted them round the works.

The carburetted water-gas plant was first visited, and proved very interesting to most members. All parts of the works were in turn inspected and equally well described; the neatness and orderliness of the place being often commented upon.

After a thorough survey of the works had been made, the party were entertained at tea by the Gas Committee and Mr. Timmins. The repast over,

Mr. HOLLINGWORTH, after apologizing for the absence of the President and the Hon. Secretary (Mr. J. Alsop), said the fact of the Gas Committee of the Wigan Corporation and men of the eminence of Mr. Timmins and Mr. Percy having honoured and welcomed the Association in the way they had done, was a matter of pride for the members. The visit had lifted the Association a step higher.

Mr. GINMAN (Birkenhead), in moving a vote of thanks to the Gas Committee, Mr. Timmins, and Mr. Betley, said he hoped the members would appreciate the great kindness Mr. Timmins had manifested towards them, not only by showing them round his own works, but also by using his influence to enable them to see the coke-ovens and iron-works, as it was a difficult thing to get into these works.

Mr. CARTER (Garston), in seconding the motion, remarked that, though all the retort-charging at the gas-works was done without machinery, the results obtained at Wigan would compare very favourably with those of any gas-works in the country. He thought Mr. Timmins and Mr. Betley were to be congratulated on getting such good results with so little mechanical assistance.

The motion having been cordially agreed to,

Mr. TIMMINS, in reply, said he was pleased to think the members had so much enjoyed the visit to Wigan. Everything on the gas-works was up-to-date, with the single exception of the retort-house; and he hoped soon to modernize this. Indeed, it would have been done long ago, but there was a strong feeling in his Committee (with which he quite agreed) that the introduction into the retort-house of labour-saving devices was not desirable, when there was so much unemployment in the town as there was in Wigan just then.

Mr. BETLEY also responded, and said he was convinced that the day's programme had been something of an eye-opener to the members.

ELECTRICAL POWER HOUSES AT NIAGARA.

An interested audience, consisting of members of the Association of Engineers-in-Charge and some visitors, listened last Wednesday evening, at St. Bride's Institute, E.C., to a lecture by Mr. Jacques Abady on the "Niagara Falls and their Electrical Power Houses." Fresh from a visit to the States, Mr. Abady had every point of his subject at his fingers' ends, and made all the details shown on a long series of lantern slides abundantly clear. The lecture was arranged for at a moment's notice, in place of one on "Boiler-House Practice" which Mr. Abady had undertaken to deliver, but had been unable to prepare owing to his absence from England.

In a few general remarks at the outset, it was pointed out by the lecturer that the question of electrical power assumes a somewhat different aspect in America from that which it occupies in this country—chiefly owing to the difference in the character of the buildings. Very many of the buildings there are, as is well known, constructed on a vast scale, and are provided in the basement with a power station supplying heat, power, and light. In New York alone, there are said to be about 7000 buildings of this type; and these represent a good slice cut out of the possible business of a central station. This, in his opinion, is one of the reasons why electricity is higher in price in many parts of America than we are accustomed to over here.

An interesting point brought out in the course of the lecture was that 25,000,000 tons of water per hour pass over the Falls; and this is estimated as being equivalent to nearly 5,000,000-horse power. Under an arrangement which has been made, the Ontario Power Company of Niagara Falls are to make a minimum charge of 36s. per horse power per annum for current supplied to the Hydro-Electric Commission for transmission to various towns in Ontario. But to this has to be added the cost of distribution, &c.; so that power users will have to pay probably 80s. per horse power per annum in Ontario as a minimum. This rate will be increased if the demand is less than that on which the minimum charges for current and transmission are based. At the close of his lecture, Mr. Abady had some good things to say about the States. "It is," he remarked, "a matter of absolute bewilderment and wonderment where all the capital and support comes from for the works put up there every day. In America, the last thing they have to trouble themselves about is anything coming in from the outside. Whether it is the protective tariff, or whether it is abundance of natural resources, I do not know; but the business aspect seems to be very much easier and less competitive than it is here."

Gas Coke or Anthracite for Suction-Gas Plants.—There has been some correspondence in the "Electrical Times" regarding the use of gas-engines in electricity stations. One of the correspondents who has charge of an electricity plant driven by suction-gas engines, referring to a statement by a previous writer, says that that writer "is not conversant with the working of suction-gas engines, or he would not say that they can only be worked on expensive anthracite coal. For the past eighteen months we have been using ordinary gas-works coke, costing (delivered) 10s. 6d. per ton. Our fuel-costs for this time (including stand-by losses and uneconomical loads) are 0·2d. The reliability of the plant has also been vastly improved since anthracite was abandoned."

COMPETITION AND DEVELOPMENT OF GAS SALES

By B. J. Bell.

[A Paper submitted to the Midland Junior Gas Engineering Association.]

During recent years, a great change has taken place in the business methods of the gas authorities; and although it is probably still true that profits are made in the retort-house, we must admit that if they are to be retained the commercial side of the undertakings must be thoroughly organized. Not many years ago, good carbonizing results and a low leakage account were the most important factors in the working of the concern; but now that competition is met in every department of gas supply, it is absolutely necessary, if gas is to retain its present position, that consumers and their requirements should be considered in much the same way as any ordinary manufacturing business caters for its customers. While the demand for gas is greater year after year, there is also a growing increase both in the number and output of electricity supply stations; and the endeavour of the latter to obtain more substantial loads is necessitating greater activity on the part of the gas industry generally.

It is not my intention to enter into comparisons of statistics in this paper, but it is interesting to note that the number of Board of Trade units sold for all purposes in the United Kingdom in 1895 was approximately 30 millions, while in 1908 the figures had increased to nearly 955 millions; and the number of undertakings, from 60 to 455. On the other hand, the make of gas according to the 1895-6 returns is given as 121,422 million cubic feet, and in 1907-8 188,486 million cubic feet; the number of undertakings increasing from 632 to 771 in the same time. A method adopted by electrical engineers for comparative purposes is that of reducing connections made to their equivalent in 8-candle power 30-watt lamps; and though the value of these figures is questioned by those responsible, they are a means of showing progress made. The following diagram has been arranged upon this basis, from the figures given in Garcke's "Manual of Electricity Undertakings," and demonstrates the growth in the number of connections made during the past twelve years.

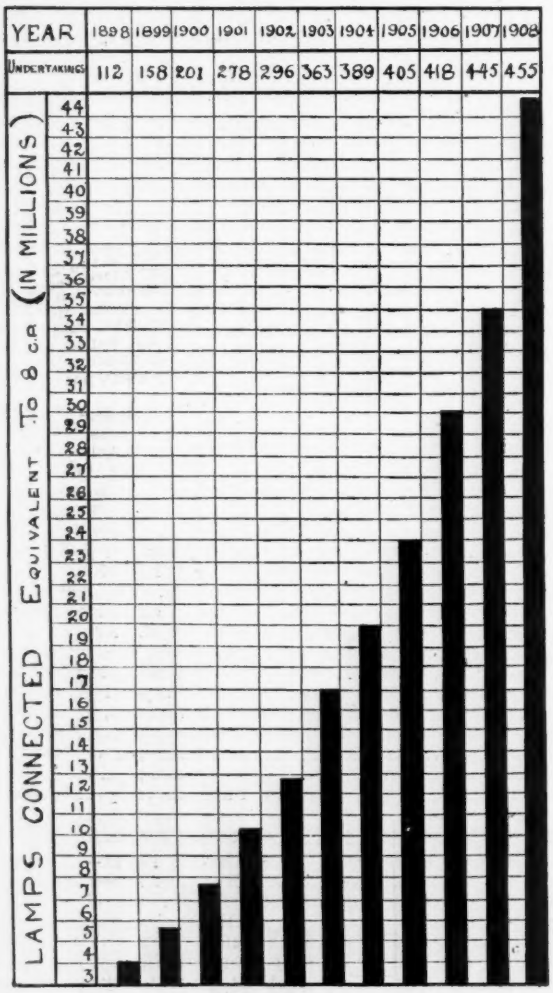


Diagram No. 1.

Before leaving this matter, it may be mentioned that, taking seven provincial towns—Birmingham, Bolton, Bradford, Glasgow, Leeds, Liverpool, and Manchester—the total sales for lighting and power purposes have been doubled in the five years ending 1908; the Birmingham undertaking alone having increased its output nearly 300 per cent. in the same time. The following diagram shows this increase at a glance.

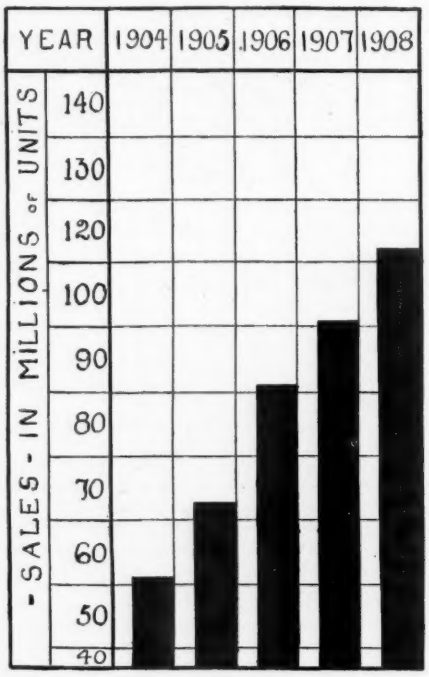


Diagram No. 2.

Obviously, these facts must be taken into consideration as pointing to the increased competition to be met with, though at the same time we have to remember the increasing prosperity of gas undertakings, which demonstrates the popularity of gas with the public generally.

The methods of charging for electric current are varied; and all manner of propositions have been brought forward and tried at different times, in order to obtain greater demand. Consequently, we have that known as the Wright system, which is a fixed rate for the first period of use and a decreased price for current used after that time; and charges are also based on the maximum demand, or, again, on a contract price and a small charge per unit. These methods do not require much consideration, as the flat-rate, with a sliding scale for large consumptions, is now more generally adopted.

Recently, however, a novel method of obtaining a class of consumer not hitherto secured has been introduced at Rotherhithe by the "Fixed Price Company." Under this scheme, the Company buys energy from the local supply station, transforms it, and supplies workmen's dwellings right along the terrace at an inclusive charge. The O.S. system of wiring is adopted, and consumers are expected to have at least three rooms wired; the prices charged for the service being 2½d. per light per week from April 1 to Oct. 31, and 3½d. per week for the remainder of the year. As the tenant is expected to have at least three lamps, and as these are tantalum lamps of 12-candle power, it will be easily seen that the consumer would be much better off with a prepayment gas-meter; for if an average of 10,000 cubic feet per annum were used, the cost, at 2s. 9d. per 1000 feet, would be 27s. 6d., against a minimum of 39s. under the proposed rate for lighting only, while the figure for gas would include that used for cooking purposes also. Under the agreement, the tenant is expected to purchase his own lamps for renewals; and although this forms a check against excessive use, the maintenance problem will considerably hamper the new venture, as the consumer will not appreciate the extra expense incurred.

Ordinary free wiring, however, has been adopted to a considerable extent; and this is more especially pushed in developing districts—the builders being persuaded to have the wiring installed while the house is in course of construction. An electricity supply company, which is looked upon as being one of the most successful in its operations, pushed free wiring of new houses to a considerable extent; the builder generally being quite willing to have his houses wired. But very often when the tenant took possession, gas was preferred. An agent of the electric company was speedily informed when a house had passed from the builder's hands, and every effort was made to secure the contract. Needless to say, the prospective consumer received the same attention from the suppliers of gas; and the fact that free wiring is practically abandoned in that district is sufficient to prove that the scheme was not successful. It is still adhered to, however, by some undertakings; and the cost of the installation is generally passed on to the purchaser of current, either as an extra charge for the current (this in some cases being 1d. or 1½d. per unit), or at prices varying from 3d. to 6d. per point. There is no doubt that, by

whatever name the system is known, the consumer pays in some way. The class of house selected for free wiring is not generally such as would adopt prepayment gas-meters; and it would not be worth while for gas authorities to enter into competition with the system by piping houses under such terms. The problem of free wiring is one for which experience is the best solution; and many electric supply authorities have, after sinking considerable capital in this way, abandoned the scheme.

When gas undertakings proved the enormous success of the prepayment meter, their competitors considered that there was a field to be exploited in the same direction, and electric prepayment meters have been introduced. Many of these installations have been fitted in houses where prepayment gas-meters are in use; and an investigation proved that, while the amount obtained for electricity did not exceed 6d. per meter per month, the gas-meters collected from 2s. to 3s. in the same period. The electric lamps were used in the scullery and bedrooms; but for the living-rooms gas was the preferred illuminant. In the offer for these installations, it was stated that the charge was based on 8-candle power lamps which could be used for eight hours for 1d. But in some districts five or six hours is the length of time an 8-candle power lamp will run for the same sum; and where every item of expenditure is so important, working-class consumers soon recognize the high cost of their light at these rates. The only conclusion to be derived is that, for this type of consumer, apart from the fixed price scheme (still in an experimental stage), there is no probability of electricity proving a serious competitor.

Houses of a better class must therefore be the field in which electricity will be pushed; and it is here that a careful watch must be kept in the future. There is a tendency on the part of architects to specify electric light in the estimates for houses they design; and it is only to be expected that the average man will accept without question recommendations made in this way, if he is not informed of the possibilities and cheapness of gas. It has been mentioned by those supposed to think otherwise, that it might be better for electric supply authorities to frankly recommend gas for all domestic purposes except lighting; and it is only that this would be a confession of weakness which prevents them acknowledging that the heating and cooking appliances now on the market are not favourably received by the majority of the public. The generation of heat by resistances presents difficulties which have not been yet solved; and if the apparatus is to be of permanent value, it must be able to withstand the hard wear and tear incidental to use in the kitchen. This cannot be claimed for the present electrical cooking apparatus, as the elements are likely to break down, whether the heat is generated by wire coils or thin resistance strips. The appliances are being improved, but have not reached the stage of perfection for even electrical people to speak very enthusiastically of the possibility of their being of such universal use as gas-cookers. The items are very costly to purchase; and it follows that hire and hire-purchase rates will be proportionately high where these are in force, and must be such as will deter the average consumer using these appliances—apart from the high consumption of current for the work done. Small copper kettles of only 3 pints capacity are listed about 32s., and these consume upwards of 800 watts; while a hot-water urn of 1 gallon capacity, which will consume upwards of 1100 watts, costs £3 7s. 6d.

It would appear that the use of current for domestic purposes is restricted to such articles of general use as electric irons. But even an ordinary household iron weighing 5 lbs. is listed at 25s., and uses about 280 watts; so that one hour for ironing with electricity, at 3d. per unit, would cost over ¾d., while a gas-iron obtainable for 7s. 6d. would use about 6 cubic feet per hour, and with gas at 2s. 6d. per 1000 cubic feet would mean an outlay of 0·18d. per hour. An appliance recently introduced is provided with four boiling-rings and a small cooker with an available space of 9½ in. by 10 in. by 14½ in.; the cooker alone using nearly 2 units per hour. Altogether, we may take it for granted that the high price and great depreciation of these appliances, along with the cost of working, will not prove attractive to consumers at present. Even heating apparatus labours under the same disadvantages; and whether convectors or glow-lamp radiators are recommended, the price, compared with gas-fires, places them beyond the reach of the general public.

But, at the same time, we must recognize that it is not sufficient merely to rely upon these factors. Consumers must be educated to use gas more fully for domestic purposes. It is a remarkable fact that this side of the business has to a great extent been left to the makers of gas cookers and appliances; and there are few towns which have not at some time had the benefit of cookery lectures given by the manufacturing firms. There is no doubt the present popularity of the gas-cooker is due to some extent to this pioneer work. Now, however, when it is not so profitable to hold exhibitions, these are not pushed as they once were; and it is a question of some importance as to whether the gas authorities, by combined action in different areas, should not take up the work in a more systematic manner.

The number of gas-cookers in use is increasing each year; but we must see to it that these are used to the greatest possible extent, and an occasional series of cookery lectures would no doubt have a beneficial effect on consumption. One difficulty experienced is that houses are built without any provision in the way of space for gas-cookers; and it is sometimes nearly impossible to find a position in which one can be conveniently fitted, as the kitchens and sculleries are cramped to provide more spacious reception-rooms. Under these circumstances, some awkward place is selected, as may best be arranged; but the ideal position is that now occupied by the kitchen coal-range. A design was submitted to builders in which, by the arrangement of the fire-place, more room was provided, and a space was left next to a small coal-range where the gas-cooker could be fixed. The place provided was fitted with enamelled back and sides; and the supply-pipes were laid in position ready for the cooker to be connected. But the scheme was not taken up very favourably, owing to the extra width required in the fire-place. There should be some possibility, however, for a fire-place of this type being arranged for districts where closed ranges are used; and the convenience provided thereby would in the end be appreciated.

The use of gas wash-boilers should be encouraged. Where they have been brought prominently before the notice of those responsible for the design of houses, they have proved exceedingly useful; and large numbers have been installed, and are giving great satisfaction. As the boilers can be purchased and fitted at less cost than the ordinary set-pot, builders are not difficult to persuade to instal them; and a good gas consumption results in this way.

The more general use of gas-fires is somewhat retarded by the fact that supply-pipes are not fitted in convenient positions for the purpose; and the cost and trouble incurred in the process deter many consumers from adopting them as a means of heating their homes. The only way of overcoming this difficulty is to arrange the supply-pipes so that gas-fires may be readily fitted in the more important rooms. Perhaps the best method is to have a separate supply for cooking and heating stoves and wash-boilers; and if a lower rate could be granted for gas used by these appliances, a secondary meter of the "Rotary" type would be a cheap method of measuring the amount consumed.

These "Rotary" meters occupy but little space, and register with sufficient correctness for the purpose. Perhaps it is expecting too radical a change in present conditions to advocate differential charges; but having regard to smoke abatement problems, it is more than possible that some development in gas supply along these lines may be seen.

Shops and factories require special consideration; and it is very important that the varied requirements of business premises should be carefully studied. As lighting of shop windows by outside lamps has come very much to the fore, every endeavour must be made to instal gas for this purpose. For ordinary shop window lighting, inverted lamps are excellently suited; and where they are supplied upon hire-purchase terms, shopkeepers are not slow to realize the advantage of having outside illumination. There is no doubt that it is a profitable scheme for the gas undertakings; for if the lamps are used on an average of ten hours per week, the consumption of four three-light lamps, using about 12 cubic feet each, would mean the respectable total of 24,000 cubic feet per annum, which compares favourably with the average slot installation.

The supply of gas for power purposes is worthy of great consideration; for it is here that electric supply stations are making headway. Specially low rates are in force for current—in some cases 0·75d. per unit; and contracts are entered into at even a lower scale of charges. We can hardly understand how it is possible to sell current at a lower rate than the total costs, excluding capital charges; but there is no doubt that many of the

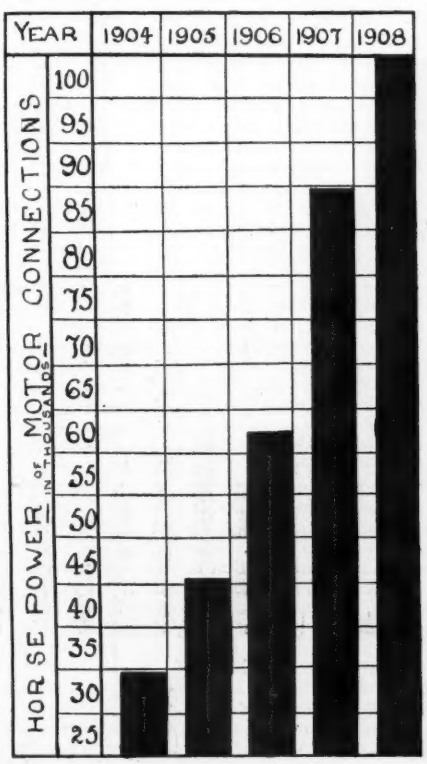


Diagram No. 3.

special contracts are obtained at a price which does not cover these charges. Diagram No. 3 gives at a glance the progress in power connections in the seven towns previously mentioned.

It must not be considered that gas-engines have been displaced to such an extent; but every effort must be made to retain the present power consumption where it is threatened, and also to induce more consumers to adopt gas for this purpose. While electric motors are generally hired or supplied on hire-purchase, it is not often that gas-engines are obtainable upon the same terms; but there seems no reason why competition in power should not be met in this way. The capital outlay is perhaps against such a scheme; but engine makers would possibly arrange terms whereby an allowance would be made for an engine in the rare event of the consumer returning one before the purchase-money was fully paid. Every user of gas for power purposes should be called upon occasionally, and his engine inspected, as the practice of keeping in touch with this important class of consumer means that any cause of dissatisfaction he might have would be readily explained away. If necessary, his engine ought to be indicated, in order to assure him that the machinery in his factory is driven at a very cheap rate.

The use of gas for commercial purposes is becoming a great factor in all manufacturing districts; and it is here that we may look for considerable development. Consequently, an intimate knowledge of the varied trades carried on in the area of supply, and the appliances especially fitted for use in the process of such manufactures, should be brought prominently before the notice of the industrial community. No doubt in the Midlands, where factories are connected with the working-up of metals, much remains to be done before we can rest satisfied; though a large number of lacquering stoves, blow-pipes, furnaces for jewelling and enamelling work, and special apparatus, are in use.

High-pressure gas is eminently suitable for trade requirements, as it abolishes the necessity of air-blowers where high temperatures are required. Though distribution has been carried out at high pressure in different parts of the country, it is not the general practice to supply gas consumers direct from the main with high-pressure gas. But this is to be done shortly in Birmingham, and the development will be watched with great interest. From experiments which have been conducted, it is found that, with high-pressure gas used with furnaces of cheap design, operations which require high temperature can be carried out with satisfactory results.

Now, the main point in the development of the gas industry is the necessity of having, in connection with every undertaking, trained men skilled to advise consumers upon all matters relating to gas supply. A connection should be established with architects and builders, in order to induce them to fit premises with supply-pipes, so that gas appliances may be easily installed; and when premises of any kind are being erected, the prospective occupier should be interviewed, with the aim of getting gas used to the fullest advantage. Manufacturers should also have special attention in connection with power and trade appliances, as well as lighting. Churches and public buildings are often supplied with electricity at a lower rate than the ordinary consumer; and the advertising possibilities of good lighting systems in places where the public gather are such that no effort should be spared to see that gas is represented to the fullest extent. An electrical engineer of some standing said that there was no need for him to employ canvassers for his work, as every contractor was practically filling that position in connection with the undertaking; and there is no doubt that this is the case. Hardly any electric installation is carried out without the public being informed of the fact by signs displayed on the premises; and sometimes we wish that gas-fitters were as enterprising.

With regard to advertising, there is to be increased activity on the part of the electrical authorities; but it is questionable whether such methods produce any valuable results. Gas people are not behind in this respect. But wordy pamphlets are seldom read by those for whom they are intended; and a more likely method of reaching the consumer is by detachable leaflets sent out with the quarterly account. Of course, catalogues should be prepared containing information as to appliances on hire and hire-purchase; and the makers of the apparatus are generally willing to provide the printed matter relating to their own productions on sheets which may be bound together under one cover. For trade purposes, separate sections may be prepared, so that inquirers get the information they need in convenient form.

Schemes for the cleaning and maintenance of incandescent burners are being generally adopted all over the country; and there is no doubt that the facilities offered will be greatly appreciated by the consumer. In some towns, free maintenance is offered; but, at the same time, it is generally thought that the consumer should pay something for the service, if inclusive rates per burner are not in force. The difficulty is that people view with dissatisfaction any addition to their quarterly account; but perhaps there is room for a scheme whereby, for a nominal fee of 1s. per annum, the incandescent burners in the house would be regularly cleaned and adjusted, or, if desired, a visit could be made only when requested. For business premises, however, the extra attention required could not be expected at this low rate. In Birmingham, the charges for periodically cleaning and adjusting incandescent burners are fixed at 1½d. to 3d. per burner per quarter, according to the number contracted for—mantles or other material supplied being charged at current rates.

There is no doubt that every point whereby beneficial results may be obtained is now being carefully considered by the gas undertakings all over the country; and great effort is being made to satisfy consumers by giving them the benefit of long experience as to the best methods of using gas economically. Considerable saving is thus effected in the quarterly accounts. Competition has only stimulated the desire for development of gas sales on the part of the industry; and instead of adversely affecting the output, the methods adopted have increased the popularity and use of gas for all purposes to which it may be applied.

DETERMINING SULPHUR IN SPENT OXIDE.

In the last number of the "JOURNAL" (p. 664), we gave a paper read by Dr. A. H. Elliott, the Engineer-Chemist of the Consolidated Gas Company of New York, before the New York Section of the Society of Chemical Industry, in which he described his apparatus for the analysis of illuminating gas. On the same occasion, he brought under the notice of the members his apparatus for determining sulphur in spent oxide. For the following illustration of it, and the accompanying description, we are indebted to the "Journal" of the Society.

The apparatus is a modification of that used by Dr. E. Graefe for determining the volatile sulphur in coal. It consists, as will be seen, of a large bottle holding about 8 litres, fitted with a rubber stopper held in place by a flat brass spring slipped on sideways. Through the stopper is a hole to carry a 100 c.c. separating funnel and two perforations for copper wires. One of these wires is short, reaching about one-third down the height of the bottle; the other carries a brass deflagration cup, as used in experiments with phosphorus in oxygen. At a point where the short wire comes near the longer one, it is covered with platinum foil, and the adjacent deflagration wire is also covered. Between these platinum terminals a connection is made with very fine iron wire, capable of being melted by the current from six dry cells.

Into the deflagration cup the operator should put a very little dry cotton wool, then connect the cotton by strands of cotton wicking with the iron at the terminals. Using 1 gramme of dry spent oxide, mix it with 1 gramme of a mixture of chlorate and nitrate of potassium (3 to 1) and place on the cotton. To start the apparatus, the bottom of the bottle is covered with distilled water, and the bottle then filled with oxygen by displacement. The deflagration spoon and wires are inserted into the bottle, the spring adjusted, and the charge fired by means of the battery. The action is immediate, and the bottle must be cooled to condense the vapours. The separating funnel contains 50 c.c. of 10 per cent. solution of sodium peroxide, which is allowed to run into the bottle when it cools. The bottle is washed out and the solution made to 300 c.c. To 10 c.c. of it are added methyl orange and 5 c.c. of dilute hydrochloric acid, and the volume made up to 100 c.c. One gramme of barium chloride crystals is added, the whole allowed to stand from 15 to 30 minutes, and the turbidity determined. A table of barium sulphate turbidities is used for the determination. Or the solution may be filtered, the barium sulphate washed, dried, and weighed as usual.

The Late Emile Leclerc.

The prominent position in the gas industry of France occupied by the late M. Emile Leclerc, whose recent death was briefly recorded in the last number of the "JOURNAL," justifies a fuller notice of his life-works than we were then able to give. He was born at Lyons in 1837, but was educated in Paris, where his family subsequently resided. He was admitted into the Ecole Centrale des Arts et Manufactures in 1857, and left it three years later with one of the first diplomas in his special subject—metallurgy. He afterwards went to Spain to take an appointment with the Seville-Xeres Railway Company. In May, 1863, he became the Engineer-in-Chief of the Compagnie Centrale du Gaz, of Paris; and for forty-four years he was the collaborator of M. Eugène Lebon, and worked for the prosperity of his Company with an amount of ability and devotion which did not diminish with advancing years. He was admitted a member of the Société Technique du Gaz in 1874, and the following year was placed upon the Committee. He was Secretary from 1878 onwards, Vice-President in 1884, and President in 1885-6. When the Syndicate de l'Industrie du Gaz was formed, M. Leclerc was chosen by the Compagnie Centrale to represent it on that body, and give to the new organization his moral and financial support. In 1896, he became President, in succession to M. Mallet, and held the position four years. At the Exhibition of 1889, he was awarded a bronze medal for his system of washing gas; and at the ever memorable one held in 1900, he obtained, in the Social Economy Section, a diploma for his works on the subject of workmen's superannuation. The decoration of the Legion of Honour was conferred upon him during the siege of Paris in 1870, when he was lieutenant of a company of volunteer engineers; and he was justly proud of the distinction.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

The Seventh Annual General Meeting of the Eastern District of the Association was held in the Heriot-Watt College, Edinburgh, on Saturday—Mr. H. RULE (Falkirk), the President, in the chair. There was a good attendance of members.

The HON. SECRETARY (Mr. J. Dickson, of Kelty) read the report of the Council, in which it was stated that the number of members was 91, consisting of 81 ordinary and 10 honorary members. There was a net gain in membership of six, compared with the preceding year. As usual, four meetings had been held throughout the session—two in Edinburgh and one each in Dunfermline and Perth; and the change of meeting-place periodically continued to be received with favour. The attendance of members at the meetings had been gratifying. The Council desired to inform the members that the Circulating Library, started this session, was being much taken advantage of; and the scheme would, no doubt, be found to be of great assistance to members, in enabling them to readily obtain the best books dealing with the gas profession. The thanks of the Council were due to the various companies and corporations for kindly throwing open their works for inspection. They likewise desired to express their indebtedness to Principal A. P. Laurie for the continued use of the Heriot-Watt College; also their hearty thanks to Mr. W. R. Herring for his handsome contribution of books to the library, and to Mr. W. B. M'Lusky for his promise of Mr. Newbigging's "Handbook." The Council desired to place on record the fact that during the year the following members of the Association had been promoted to larger spheres of influence: Mr. W. Brown, of Lasswade, to Cardenden; Mr. J. D. Luck, of Broughty Ferry, to be chief meter inspector for the Hawick Gas Company; Mr. F. N. Oakley, of Granton, to be Engineer and Manager of the Berwick Gas Company; Mr. F. A. West, of Kirkcaldy, to be Works Superintendent of the Peterborough Gas Company; and Mr. J. Dickson, of Kelty, to be Engineer and Manager to the Forfar Gas Corporation.

Mr. J. R. MOYES (Edinburgh) moved, and Mr. W. GEDDES (Edinburgh) seconded, the approval of the report; and the motion was agreed to.

The HON. SECRETARY read the Treasurer's report, in which it was stated that the income for the year, including £12 6s. brought forward, amounted to £35 19s.; and that there was a balance on hand of £10 15s.

On the motion of Mr. D. BISSETT (Edinburgh), seconded by Mr. R. B. WADDELL (Dunfermline), the report was adopted.

The following were elected office-bearers for next session:—

President.—Mr. W. Dunlop, of Kirkcaldy.
Vice-President.—Mr. John R. Moyes, of Granton.
Hon. Sec. and Treasurer.—Mr. W. Geddes, of Granton.
Members of Committee.—Messrs. R. W. Cowie, of Dalkeith; H. E. Doran, of Granton; and T. W. Harper, of Dundee.

LUTELESS PURIFIERS AT THE DUNDEE GAS-WORKS.

Mr. A. MORTON FYFFE, Assistant Engineer and Manager at the Dundee Corporation Gas-Works, read a paper descriptive of the new luteless purifier system there.

The author said he had chosen this as the subject of his paper because he considered it would be of interest to the members to have a description of the plant recently completed at the Dundee Gas-Works, and also because it was one of the most interesting pieces of work with which he had had the pleasure of assisting Mr. Yuill. He would first of all describe the plant as it formerly existed. It consisted of three sets, having four purifiers in each, measuring 30 ft. by 20 ft.; and two sets, also of four purifiers each, measuring 20 ft. by 20 ft., and giving a total capacity of about 4 million cubic feet per diem. These purifiers were all on the ground level, with the revivifying floor overhead. When it was mentioned that one of the larger sets had to be reserved as part of the carburetted water-gas plant, it would be seen that the purifiers were taxed to their utmost capacity when dealing with a winter load of fully 4½ million cubic feet per diem.

In first considering any suggested alteration or addition to any part of the plant or apparatus constituting the Dundee Gas-Works, the first procedure was inevitably to refer to the "prospective" plan of the works. This was a plan prepared about seven years ago, showing the adaptation of the ground area of the works as it would be when the maximum daily demand was 10 million cubic feet, compared with the present maximum demand of 5 million cubic feet per day. This plan was the object of much thought and careful consideration when it was first drafted; and since that time numerous and extensive alterations and additions had been carried out, all in strict conformity with the plan—thus ensuring that no future alterations would be prejudiced by any structures erected. The plan showed the purification of the final make of 10 million cubic feet per diem provided for by the introduction of three sets each of four luteless purifiers, each purifier 45 ft. by 35 ft. and 6 ft. deep, and the retention of one of the present sets for carburetted water gas.

It was decided to proceed with the erection of one of the large luteless sets, or one-third of the whole, which would for the immediate future be operated in conjunction with the existing purifiers. The north portion was selected as the first to be dealt with, as it would necessitate the least interference with the old purifiers; involving only the removal of one of the small 20 feet square sets, which, as a matter of fact, was almost beyond use. Accordingly, in the spring of last year a start was made to remove this set, and also the corresponding part of the upper floor and the roofing. The new structure being designed with the purifiers overhead, and supported by cast-iron columns, it became necessary to provide foundations of ample strength, as the completed load, including the material in the purifiers and on the upper revivifying floor, was calculated at 1600 tons, which, supported on 42 columns, meant a load of fully 38 tons on each column.

Part of the erection was on ground where the natural rock bed was 10 feet from the surface. The column foundations there consist of monolithic concrete, raised on the rock with foundations 6 feet square, and "stepped in" according to the varying depths, until the top portion to receive the column base measured 3 feet square. In this final block four foundation bolts with bed-plates were embedded, to receive the base of the column, which was 2 feet square. The other part of the foundation came on the site of an old gasholder tank, evidently long since filled up; and to ensure a reliable foundation there, piling of the following description was resorted to: The foundation for each column consisted of four Hennebique ferro-concrete piles, each 14 inches square and 16 feet long, driven so that the exterior sides formed a square 3 feet in dimension; the piles being driven until ten blows of a 3-ton "monkey," with a fall of 4 feet, gave a set not exceeding one-eighth of an inch. After these piles had been driven to the proper set, the concrete was stripped from the top 18 inches; and the steel rods thus exposed were embedded in a concrete block 4 feet square; this being then reduced to 3 feet, as in the simple concrete foundations.

There could be no doubt as to the entire suitability of ferro-concrete piling for such a piece of work, from the standpoints of both strength and economy. The piles were made on the site, and allowed to harden for six weeks in the open; and, after being driven, it was impossible to detect any flaw or even any mark on the heads. It might be of interest to mention that the foundation bolts built into the concrete foundations were each surrounded by a slim wooden box, 2 inches square, and the same length as the bolts, to allow of easy placing of the columns; and when these were being placed, the wood was broken out, and the space grouted with cement.

Having described in detail the iron and steel structure constituting the purifier-house, the author proceeded to give the following description of the purifiers: There are four luteless purifiers, in pairs; the internal dimensions of each pair being 90 ft. by 35 ft. and 6 ft. deep. The length of 90 feet is divided into two sections by centre plates—forming two purifiers in each stretch (four in all), each 45 ft. by 35 ft. and 6 ft. deep internally. They are erected on rolled steel girders, forming the first floor of the structure. The bottom plates are 5 feet square, with flanged joints—the jointing being on the under side, resting on girders; thus making the bottom of the purifiers a plain surface. The side and end plates are 6 ft. 3 in. by 5 ft., flanged, and having moulded panels. The top plates are also flanged on the under side, and are supported by cast-iron brackets at the sides, and by cast-iron pillars and brackets at the centre. All the plates are 1 inch thick throughout, with flanges 3½ inches wide, strengthened by angle webs at 6-inch centres. All flanges are planed and finished true, with the exception of a longitudinal groove 1 inch wide and ½ inch deep, to form a bed for the red lead, which is the only jointing material used, the plates being connected by 1-inch bolts placed at 6-inch centres.

Each purifier has four covers, the openings for which are 18 ft. 6 in. by 13 ft. 6 in. The framework of the covers is formed on the top plates round the edges of the openings, by cast-iron channels 6 in. by 4 in. by 1 in. thick web, strengthened at every 6 inches, and flanged for bolted joints at the end of each length. The covers are constructed as follows: External framework, 6 in. by 5 in. by 17 lbs. per foot steel angle; bottom bracing, three longitudinal stretches of 6 in. by 5 in. by 12 lbs. per foot T steel; top bracing, seven cross stretches of 8 in. by 5 in. by 18 lbs. per foot bulb tees; covering, ¼ inch steel plate, riveted to the bottom tees and to the top bulb tees. The jointing device employed is Clapham's joint and fasteners of the standard type.

On the top of each purifier, two relief-valves are fitted, 12 inches diameter—the covers to open horizontally, and with planed faces. On the bottom, four discharging openings are fixed. These are 15 inches in diameter, and are similar in construction to the relief-valves. Iron standards and railings are fixed round the outside and the ends of the purifiers. The valve was of the Weck type, having 30-inch main inlet and outlet connections with 24-inch inlets and outlets carried through the bottom of each purifier.

In connection with this part of the plant, it may be interesting to mention an arrangement provided to prevent loss of gas which would otherwise be inevitable in opening the purifiers. On the inlet and outlet pipe of each purifier, a 6-inch flanged branch is formed, and to each of the branches a valve is fixed. These valves are all connected to one common pipe, which is carried to the foul main at a point between the retort-house and the condensers. It is operated as follows: Before a purifier is opened, the 6-inch valves on its inlet and outlet are opened, when the gas remaining therein is drawn back to the foul main, instead of escaping into the atmosphere, as it otherwise would. To prevent over-exhaustion, gauges are connected to the 6-inch pipes, and the valves are closed immediately a level gauge is attained. Similarly, when

the purifier has been recharged, and just before being put to work, the operation is repeated; thus exhausting the air to the foul main, where its presence is not appreciably felt, and preventing it going forward direct to the holder. This arrangement has worked very well in actual operation. The 6-inch valves are fitted with a locking arrangement to prevent any interference by unauthorized persons.

The grids used are of the hurdle pattern, supported on a first tier of common grids, and arranged so that, if desired, another tier of common grids may be placed on the top of the hurdles, to allow of 12 inches of lime being used on top of the purifier.

The lifting arrangement for the covers is a very simple one, consisting of runners of broad flanged 12 in. by 12 in. steel girders suspended from the underside of the second floor. On these girders, light four-wheeled carriages run; and from the carriages are hung 3-ton ball-bearing pulley-blocks. Two of these easily lift and remove a cover weighing about 4½ tons; the operation being conducted comfortably by two workmen. It might be considered that some sort of power lifter would have been used for these covers; but, on second thought, it will be realized that this would be both unnecessary and expensive. The covers will only require to be removed (say) three times a year; consequently, if power lifting were adopted, capital charges would be incurred for plant constantly standing idle, which, in any case, would require two workmen to operate it; whereas by the simple hand-operated arrangement, complication and expense are avoided and working costs are not in the least increased. It is well to bear in mind that mechanical or power plant does not necessarily mean labour-saving plant.

A gravity bucket elevator, driven by a gas-engine, conveys the material from the railway in the lime and oxide shed, which is alongside, and parallel to, the purifier-house, to the top floor, where it is received by an overhead hopper, from which it is drawn as required. When a purifier is to be emptied, half of the oxide is allowed to fall through the bottom discharge-doors to the ground floor, and the other half is taken up to the second floor; thus giving two floors for revivification. The whole of the material can, of course, be taken up or down to either floor if desired. The material is carried to the top floor by means of hydraulic jiggers, consisting of a ram geared up 12 to 1.

The author next indicated as follows the procedure adopted in connection with the work he had described: First of all, general design plans were drawn; and when these had been carefully adjusted, full detail drawings of every single part were prepared. Specifications, embodying every condition, every dimension, and the composition of each material, were prepared and issued to contracting firms, together with a complete copy of the drawings. Firms offering thus knew the dimensions of every bolt and nut to be used, the exact length of every girder, and the tensile strength, the elongation, and even the chemical composition, of all parts. The offers were capable of instant comparison, and every offerer was assured of fair dealing. This is impossible when contractors are asked for offers on their own design, or on incomplete specifications and drawings. Moreover, all materials were examined, tested, and analyzed by myself at the various contractors' and makers' works before being delivered.

In conclusion, the author mentioned that the old purifiers and buildings were first interfered with at the beginning of March, 1909, when a start was made with their removal. The work was completed by the end of August, and cost £13,497, against an estimated cost, reported before the work was specified, of £13,500.

Discussion.

Mr. R. W. Cowie (Dalkeith) said he had seen the purifiers described in the paper, and what struck him most was the way in which they had been built with a view to future extension. He could understand this now, when he heard that there was a "prospective" plan made before the work was undertaken. The idea of such a plan was a very good one. He was impressed by the saving of the gas that was within the purifier at the time it was shut off, as in the case of large purifiers the loss was considerable. With oxide, of course, the air that was sent back to the foul main when a purifier was turned on would act in the way of revivifying *in situ*. He did not know that such an arrangement could be used in small works; but this subject could be thought out.

Mr. D. Bisset (Edinburgh) asked whether luteless purifiers had been found an improvement upon water-luted boxes.

Mr. J. Dickson (Kelty) said what struck him was the minute care with which the work described had been undertaken, and the very particular way in which Mr. Fyffe saw to the testing of the materials before they were delivered at the works, and also supervised the work. He saw the arrangement to which Mr. Cowie had referred, and thought it an excellent one. At the same time he did not know whether it would be profitable to apply it to small works. In the case of the Dundee purifiers, he found that about 5000 cubic feet of gas would be lost each time a purifier was shut off. If the purifiers were emptied three times a year, this would be 15,000 cubic feet for each box. But he supposed that the main idea that Mr. Yuill had was to avoid blowing gas away at a place where there was fire. He thought that the chief point in the arrangement was safety from explosion; but for small works it might not pay, on account of the capital cost.

Mr. R. B. Waddell (Dunfermline) remarked upon the unsuitability of ferro-concrete for certain classes of work, more particularly for the second floor.

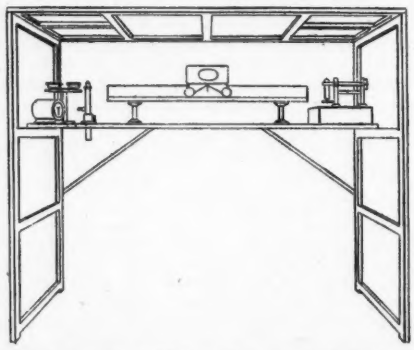
The President said that though most of the members had not had, and might possibly never have, experience in the erection of so large an installation of purifiers as the one described, they had nevertheless appreciated the contents of Mr. Fyffe's paper. So far as the constructional part of it was concerned, there was perhaps little that was controversial in it, and especially as Mr. Fyffe had informed them that everything had turned out so satisfactorily. In the case of rubber jointing, great care had to be exercised, both in the selection of the design and in the subsequent use. The life of the joint had to be taken into account, because the price of rubber was such that renewals were a matter of consideration. Care must be exercised not to screw the corners down too tight, because this would flatten out the rubber too much. The method of holding the rubber to the lift by means of a T-bolt was of little use. Between the bolts the rubber only got a hold of the cover by means of a solution, which eventually gave way; and the result was that festooning between the bolts took place. He noticed that they had adopted a Weck valve in Dundee. This might be found to be a very good arrangement; but, of course, it required attention to the spindles and screws. He would advise the members to see, during construction, that all bolts were screwed up tight, because he knew of a case where a bolt was left out, and there was considerable trouble with foul gas passing. Hollow columns inside purifiers should be filled with cement. In one case of which he knew, they were not filled up, and they had considerable trouble and anxiety in finding out where the foul gas was coming from. They discovered that it was passing up through the hollow column. He thought Mr. Yuill was to be congratulated on the cost of the work turning out to be less than was estimated.

Mr. Fyffe, in reply, said he was glad if the members had derived any benefit from his paper. Had Mr. Bisset had experience of the two forms of purifiers working side by side, he would have found there was no comparison between them. The luteless was far before the water-luted purifier in many ways. First of all it meant that the covers could be made much lighter; and this involved a very simple arrangement for lifting. With this size of purifier, the weight of the covers would be enormous. Powerful apparatus would be required for lifting them. Then, the covers only requiring to be raised about three times in the year, a large amount of capital expenditure would be lying idle. With luteless purifiers, they had no risk with frost in winter. They had found the rubber joints to work quite satisfactorily, and to give no trouble at all; but they had to be properly adjusted before being brought into use. Everything required to be dead-true, and almost mathematically correct; but this having been once done, he thought there was no comparison between the luteless and the water-luted covers. No doubt the first cost of the luteless cover was less than the other, apart from working costs. The only ferro-concrete in the work was in the foundations. He agreed with what had been said about taking the gas and air back to the foul main—that it would be hardly worth while adopting this method in small works. But when they had purifier-houses 30 or 40 feet square, there was no doubt that, apart from saving, they ran less risk of blowing gas into the air; and they also avoided sending a large quantity of air into the holder, which might affect their supply. When taken back to the foul main, the air mixed with the gas, and its presence was therefore not felt.

A paper on the "Formation of Coal" was then read by Mr. H. E. Doran. An abstract of this communication, and a note of the few remarks to which it gave rise, will appear next week.

Portable Bar Photometer.

In the course of the proceedings at a meeting of the New York Section of the Society of Chemical Industry, an account of which appears in the current number of the Society's "Journal," attention was directed to the portable bar photometer used by Dr. E. G. Love, the Chief Gas Examiner for the City of New York. As will be seen from the accompanying illustration, it consists of a wooden framework supporting a platform on which



is placed the bar and sight-box, the candle-balance, gas-pillar, governor, and special small wet meter. The whole is enclosed with opaque black curtains (not shown in the illustration). In these there are openings at the top over the gas-pillar and the standard light. The operation of the photometer does not differ from that of any ordinary open-bar photometer constructed for a dark room.

REGISTER OF PATENTS.

Purification of Gas.

FELD, W., of Hönningen-on-Rhine, Germany.

No. 3061; Feb. 8, 1909.

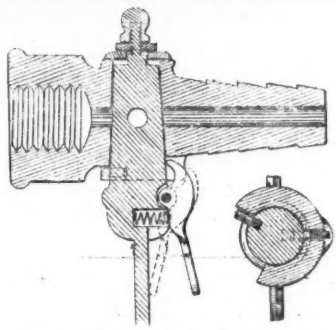
The patentee claims as his invention: "Obtaining or utilizing sulphur from sulphuretted hydrogen and sulphur dioxide for the treating of gases with a compound of a metal, the sulphide of which is on the one hand insoluble, and on the other hand is decomposed by sulphur dioxide, either alone, or in the presence of sulphur, or air, or other oxidizing agent, or basic or acid compounds, or of a mixture thereof." The specification is abstracted on p. 729 of to-day's issue of the "JOURNAL."

Safety Gas-Burner Cock.

JAKOBSON, M., of New York City.

No. 3319; Feb. 10, 1909.

This invention relates to safety-cocks for gas-burners of the type in which the plug has a pawl or locking lever pivoted centrally to it, with the handle end of the locking lever arranged sideways of the plug handle; the locking lever being acted on by a helical spring in a socket in the plug so as to engage a recess in the plug-casing to lock the plug in its closed position. The cocks are thus locked when the plug is closed so as to prevent their accidental opening and an escape of gas, while it permits the easy operation of the cock when opening and closing it. As shown, the fixture or bracket has a tapering socket open at its lower end and provided at its lower edge with a notch. The plug



Jakobson's Safety Gas-Burner Cock.

(provided with a key or handle) turns in the socket, which is cut laterally above the handle. There is a finger lever fulcrumed intermediate of its length to the plug, the construction of which is such that, by bending it intermediately (so as to form two portions which extend at right angles to each other), the upper portion extends into the notch of the bearing sleeve, while the lower portion extends alongside, and parallel with, the plug handle. A projection is formed on the lever at its inner edge opposite the socket (immediately below the pin on which the lever is pivoted), so as to engage a helical spring seated in the socket and fitting over the projection.

Pressure-Controllers for Automatically Lighting and Extinguishing Gas-Burners.

SPARKS, E., of Tufnell Park, N.

No. 4218; Aug. 19, 1909.

This invention relates to pressure-controllers for automatically lighting and extinguishing gas-burners of the kind described in patent No. 8690 of 1908 [see "JOURNAL," Feb. 9, 1909, p. 391]. The invention comprises certain details of construction in connection with the movement of the piston within the controller, to facilitate and assist its movement when required and to ensure its remaining stationary at other times.

Manufacture of Incandescent Gas-Mantles.

MULLER, J. L., of Sannois (Seine et Oise), and BONNET, J., of Paris.

No. 6556; March 18, 1909. Date claimed under International Convention, March 20, 1908.

This invention relates to improvements in machines of the kind described in patent No. 24,218 of 1901, for calcining mantles intended for gas lighting by incandescence, after they have been previously prepared and soaked in a solution of oxides of rare metals.

The improved machine effects the following operations mechanically: Singeing at the upper portion of the mantle; singeing at the bottom portion of the mantle, in case the first singeing should be incomplete; incineration of mantles in three successive stages; calcining the mantle and burning the head of the mantle; cutting the mantle at a variable height; soaking the mantle in collodion; and drying the mantles.

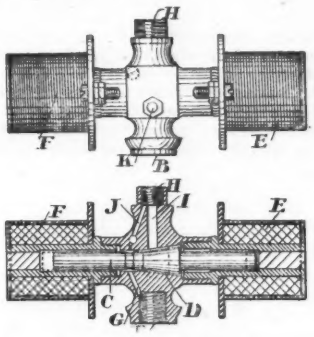
A construction of the machine according to this invention is illustrated by twelve sheets of drawings (containing forty separate figures); while the printed specification extends to sixteen pages of print.

Lighting and Extinguishing Gas-Lamps.

HARRISON, J., of Gomersal, near Leeds.

No. 7242; Sept. 16, 1909.

This invention relates to electrically actuated gas cocks or valves; the novel feature lying in the employment of a horizontal valve stem or spindle having a conical plug or valve-head adapted to register in a correspondingly shaped seat in the valve casing, so as to ensure a tight fit between the valve-head and its seat and positively prevent the escape of gas when the valve is closed. Very little movement of the spindle suffices to open or close the valve.



Harrison's Gas-Lamp Lighter and Extinguisher.

The valve casing is screwed on to the gas-supply pipe at B, and C is a horizontal stem or spindle adapted to slide within the casing, and provided with a conical plug normally registering in a correspondingly shaped seat D. Into opposite ends of the casing are screwed a pair of solenoids E F, into which the ends of the spindle C projects. The solenoids are provided with terminals connected to separate switches (not shown) situate in a central station, from which a series of the cocks or valves may be synchronously actuated. G is the gas-passage from the supply pipe to the central cavity in the valve casing. I is a passage from the cavity to the burner pipe (which is screwed on to the valve casing at H). J is a bye-pass. The valve is earthed by a wire connected to the terminal K.

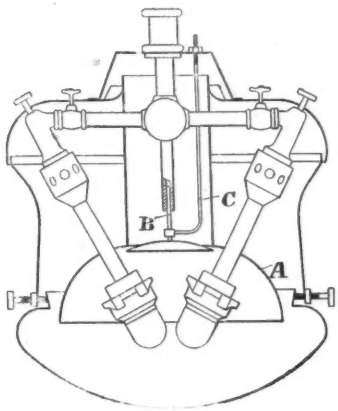
Normally the valve stem occupies a position (shown in dotted lines), so that the cavity D is plugged and only a small pilot light at J issues from the burner. On the operation of the switch controlling the solenoid E, the stem C is moved to the right (position shown in full lines), and the full stream of gas is allowed to pass to the burner. The operation of the solenoid F, on the other hand, returns the valve stem to its original position, and reduces the flame to a mere pilot light.

Incandescent Gas-Lamps.

JIROTKA, B., of Berlin.

No. 9434; April 21, 1909.

This invention relates to incandescent gas-lamps of the class in which the burners carried by sloping tubes are located in an enlargement at the lower part of the chimney; a baffle-plate, serving also as a reflector being above the burners.



Jirotka's Incandescent Burner Lamp.

In the enlargement A at the lower part of the chimney are the burners fixed to tubes in which the gas is mixed with air. The burners are fixed at an angle to the vertical axis of the lamp. "In consequence of this position, the holes through which the fresh air enters the mixing-tubes come to lie at a place where the air contains much oxygen." By means of the reflector, which can be moved up and down, the escape of the hot gases can be regulated. It is fixed to a spire B, sliding in a tube and moved upwards and downwards by the rod C.

Inverted Incandescent Gas-Lamps.

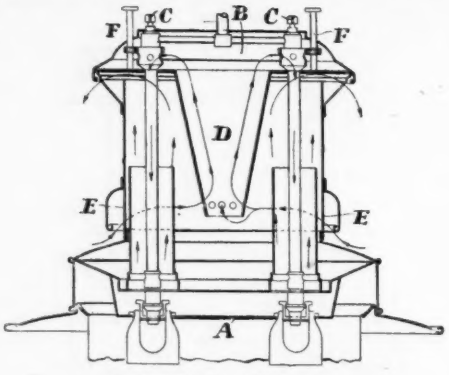
EHRICH AND GRAETZ, of Berlin.

No. 10,946; May 8, 1909. Date claimed under International Convention, Feb. 6, 1909.

This invention relates especially to inverted incandescent gas-lamps intended for use in the open air. The collecting chamber is supplied with air drawn from a point within the chimney casing and out of the path of the burnt gases, so as to avoid the danger of drawing the burnt gases into the collecting chamber. Further, the air supply connection to the collecting chamber is provided with a narrow part so as to damp wind currents. The arrangement proposed consists of an inverted conical pipe having its wide end fixed to the collecting chamber, and its narrow end opening into the interior of the lamp casing at a point below the free exit of the burnt gases into the casing.

The lamp casing is closed at the top by a cover and at the bottom by

a plate on which the reflector A is mounted. On the top plate is an air-collecting chamber B, in which the suction chambers of the burner-tubes are arranged. The gas is controlled by externally arranged screws C, which pass outside the upper cover plate of the air-collecting chamber. The burnt gases from the mantles pass upwards through pipes arranged around the burner-tubes. To the cover plate, which also forms the bottom of the air-collecting chamber, there is fixed a conical pipe D, which narrows downwardly, and is conveniently provided with holes near its lower end. These holes, and the lower end of the conical pipe, are arranged to open into the interior of the lamp casing below the free exit of the burnt gases; and these burnt gases pass from the casing through openings below the air-collecting chamber B. Air



A Modified Graetzin Lamp.

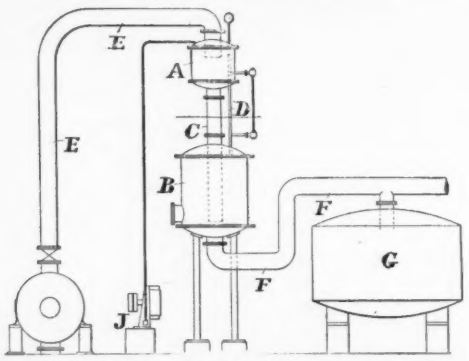
enters the interior of the lamp casing through openings E over which a hood is arranged. By providing the pipe D with a narrowed portion, or with the holes shown, the air passing to the collecting chamber is throttled in its passage, and thereby the burner-tubes are not affected by impacts of the wind. At the same time, all ingress of burnt gases to the air-chamber is prevented by arranging the openings and the open end of the pipe D well out of the path of the burnt gases and below it. The parts of the lamps which require inspection and regulation are readily accessible. Thus the nozzle controls C may be readily adjusted without detaching any part of the lamp; and, further, the air-control rings for the suction chambers are adapted to be adjusted by means of a spindle F carrying a toothed wheel engaging suitable gearing on the ring.

Preventing Shocks or Vibrations in Liquid Pipes, &c.

GUNN, G., of Heywood.

No. 11,785; March 19, 1909.

This invention relates to a device for the prevention or reduction of vibration or pulsation, or other abnormal disturbances, owing to the working of pumps or from other causes, being transmitted through the medium of the flowing liquid to the point of delivery. It is particularly applicable for the prevention of disturbance in filter-beds caused by the pumps supplying them with water, but may be adapted for the use of other liquids and gases than water and air.



Gunn's Apparatus for Preventing Vibrations in Reservoirs, Pipes, &c.

The proposal is to break the flow of the liquid at any point between the source of the shocks or vibrations and the point of delivery, by causing the liquid to flow through an air-vessel having the inlet for the liquid in the upper portion, and an outlet at the lower portion. The air-vessel consists of two chambers (preferably cylindrical) as A and B—one placed vertically over the other. The upper chamber is of less capacity than the lower one, to which it is connected by a pipe C, which comes direct from the bottom of the upper chamber and passes through the top of the lower one to a point near the bottom. The pipe is of such diameter that it will pass the maximum quantity of liquid required. An air-pipe D connects the top of the lower chamber with the upper one. The inlet pipe E enters the top of the upper chamber and projects internally to about one-third of its depth; while the outlet pipe F is connected direct to the bottom of the lower chamber. The pulsating liquid from the pump enters the top of the upper chamber and falls through an air space, then passes down the connecting pipe C to the lower chamber, and from thence, through the pipe F, to filters G. If the pressure increases in the air-chamber A and B, the liquid gradually rises until it is about half-way up the air-pipe D, where it should be maintained, if necessary, by pumping in air from the air-compressor J at intervals.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Objectionable Pressure in Intermittent Vertical Retorts.

SIR,—In your editorial remarks on Mr. Harris's paper read before the Midland Association, you say "that devices for grading the charges into large and small on opposite sides of the retort have cured the trouble in this regard, though it has introduced an additional operation." Our porous charging shoot patent No. 19,437, illustrated in the "JOURNAL" for Oct. 5 last (p. 27) obviates the necessity for this additional operation, saves all cost of screening coal, and, in practical use, is certainly reliable and automatic.

On reflection, readers will see that if during charging, a retort be fed by a stream of slack and a stream of nuts simultaneously, a column of nuts will be built up in the retort from the bottom to the top *only if the two streams deliver precisely the same bulk of coal in precisely the same time*. Even a slight fluctuation in the rates of flow will cause the surface of the coal in the retort to form at an inclination, and the nuts will roll to the bottom and become mixed with the slack; and thus the effect of the previous screening of the coal will be largely nullified, and the porosity of the charge impaired.

With our patent porous charging shoot, unscreened coal is fed into the retort in such a manner that a bank is always formed at the surface of the coal as the charging proceeds. The momentum of the nuts is arrested as they impinge upon the uppermost portion of the bank; and they then roll gently down the sloping bank into position on the opposite side of the retort. The action continues until the retort is charged; and it results in a very porous column of nuts being formed within the retort.

This is not a theoretical assertion; it is a practical truth. We have proved experimentally that the column thus formed contains 84 per cent. of very lightly laid nuts, which, in appearance, look all nuts.

In one bed of our retorts over 3000 tons of various sorts of coals have been carbonized, and the maximum pressure so far recorded at the bottom mouthpiece has been 12-10ths, and with most coals 5-10ths to 7-10ths, and this for a short period of the carbonization period only.

ROBERT DEMPSTER AND SONS, LTD.
per J. W. Broadhead, Managing-Director.

Elland, March 12, 1910.

Direct Sulphate of Ammonia Manufacture.

SIR,—In reply to your correspondent's query in the current issue of the "JOURNAL" (p. 642), might I say that I have not examined any specimens of sulphate of ammonia made by the processes to which he particularly refers.

I have from time to time examined various specimens, and I might add that only on rare occasions has the percentage of ammonia been as high as 25·5. In my opinion, a salt of that "consistent" standard of purity in the ordinary manufacturing process, is exceptionally good. But your correspondent only gives the result of one analysis. If he could give a number of analyses made independently, and preferably by different methods, and so obtain a good average percentage, his results would be much more convincing. Another important factor, too, is the quantity of salt used for analysis; for while one crystal may be perfectly pure, another might be found to contain a moderate amount of impurities.

I would also suggest that, if this has not been done, an estimation of the amount of SO_4 in the salt be made, as this will act as an additional check. If the amount of SO_4 found corresponds with the amount of NH_3, then the results will be looked upon as much more reliable from a chemical point of view.

With regard to my own experiments, no analyses of the salt obtained were made, as the process was not considered to be quite satisfactory. In the second process (described in an article you already have for publication*), analyses were made; and in the case of the works experiment the salt obtained contained 25·48 per cent. of ammonia and 72·1 per cent. of SO_4 (theoretical = 71·94 per cent.). Adding in the theoretical percentage of the extra H_2—*i.e.*, 1·64 per cent.—it brings up the total salt to 99·22 per cent. This leaves less than 1 per cent. for impurity. I must add, however, that only a small sample of sulphate was analyzed; and the results given are the mean of two analyses only. As the work was in a purely experimental stage, it was not considered necessary to perform further analyses.

I should be interested to know also by what tests your correspondent proved the absence of tar and free sulphur.

G. STANLEY COOPER, B.Sc.

March 10, 1910.

SIR,—Referring to the article by Mr. G. Stanley Cooper, B.Sc., contributed to the "JOURNAL" for Feb. 22, on p. 496, I was hoping something more would have been written to extend this valuable research; and I do hope some of your readers will not allow the matter to drop. I refer to gentlemen such as Mr. Owen Jones, of the Chatterley Gas-Works, who I know has been at work upon this class of salt-making for some considerable time—I having made a saturator for him for direct working.

I shall not be doing any harm, if no good, by laying a few practical hints before your readers regarding the tar-extraction business. In the first place, some 38 years ago it was my good fortune to meet Mr. Fish, then Manager of Hornsey Gas-Works, who had a lot to do with tar troubles in different ways; and so from practice I have come to the conclusion that the following is the best method of extracting the tar before the ammonia enters the saturator. It may be new to thousands of your readers.

I made a cylinder, 12 feet long and 3 feet diameter, and fixed it on end. Within this, I fitted a tier of dome-shaped strainers, made like gongs or inverted cones having 1-12 inch holes. These strainers, made

*This article appears on p. 721 of to-day's issue.—ED. J.G.L.

of sheet lead, were arranged on a revolving spindle; and the edges of the strainers just cleared the sides of the cylinder. In the bottom of the cylinder I fixed a 2-inch pipe to form a lute, into a corresponding pipe sufficiently deep to withstand the gas pressure, and with a spout at the upper end.

The ammonia gas is first forced into or through an old boiler, heated to 220° Fahr., and then into the cylinder, where it passes the sieves and away to the saturator. The tar which is not in bubbles of themselves, but smaller atoms carried with the ammonia and gas bubbles become thinned out in the warming-up boiler, and are carried forward into my cylinder. They adhere to the metallic sieve holes, where the tar accumulates and is flung off to the cylinder sides and falls into the lower part of the cylinder to the lute, while the ammonia is freed ready for the saturator.

I at one time—while at Ramsgate, I think it was, under Mr. Valon—had some tar troubles; but I got over them by heating alone and flotation.

Perhaps Mr. Wilton would assist us in the matter, as I know he worked a lot at this business when I was at Beckton.

117, *Galloway Road, W., March* 9, 1910. P. J. DAVIES.

The Flow of Gas.

SIR,—I am pleased to note that Mr. Foulger, in his article on "The Flow of Gas through Pipes," in the last number of the "JOURNAL," coincides with the view I expressed in a previous article, as to the band, or lining, or coat, of stationary gas—"dead gas" I termed it—round the inside of the pipe, reducing the space for the travelling gas—"active gas" I termed it—in the centre, and as illustrated in the sketch accompanying my article in the "JOURNAL" for Feb. 22. It is also gratifying to learn that Mr. Foulger's experience tends to justify the acceptance of Dr. Pole's formula, under the conditions to which it was intended to apply, and that, for all practical purposes, it has hitherto done good service. But that this formula is open to improvement and to correction to meet other conditions, I think we have all long agreed.

The suggestion emanating from Mr. H. E. Jones (in his letter to the "JOURNAL" for Feb. 15), that experiments should be made under practical conditions, is therefore worthy of the support of gas engineers; and if Mr. Chandler is in a position to take charge of them, I am confident—judging from his article in the "JOURNAL" for Feb. 8—that good would result.

We must, however, bear in mind the extreme difficulty of making experiments which accord with actual practice. The one factor which it is most desirable to take into consideration is the one most difficult of attainment. I refer to the withdrawal of gas *en route* by branch mains and services.

To test a long, conveniently arranged, stretch of straight pipe is one thing; to arrange for testing it with innumerable branch mains and services, tapping it in ever-varying quantities, is quite another. Therefore, beyond determining the simplest cases, we can never hope to do more than devise rules, more or less approximate, and which have in their application to be tempered with engineering instinct, coupled with a vast amount of common sense, derived from experience.

In the descriptive pamphlet accompanying my "Gas Flow" diagrams published in 1892, I treated the simplest cases involving the effect of branch mains, leading up to more complicated ones. That was, I believe, the first attempt of the kind to elucidate this phase of the subject; but to test its accuracy by actual experiment would involve very complicated arrangements.

71-72, *King William Street, E.C., March* 9, 1910. F. S. CRIPPS.

SIR,—With regard to the discussion which has been taking place in your columns, *re* the "Flow of Gas through Pipes," we would venture to call your attention to the fact that weldless steel tubes, such as were used and referred to by Mr. George Helps, of Nuneaton, have been proved, by actual experience, to have 30 to 40 per cent. greater delivery capacity than that of cast-iron pipes. This, of course, is due mostly to the smoother surface, reducing friction to a minimum; and the extent of the difference would apparently be explained by the opinion given by many of your readers—*i.e.*, that friction produces a band of stationary gas round the inside of the pipe, thus reducing the space for the travelling cone of gas in the centre (to use Mr. Foulger's wording).

March 9, 1910. BRITISH MANNESMANN TUBE CO., LTD.

Mr. Kendrick's "Coalexld" Tests.

SIR,—I have had my attention called to an error in Table IV. of the "Coalexld" tests (*ante*, p. 580) in my Inaugural Address to the Manchester Institution. The figures should be:—

	Gas. B.Th.U.		Coal.		Coke.	
	Gross.	Net.	Calories.	B.Th.U.	Calories.	B.Th.U.
Without chemicals .	609·7	524·4	3687	14,600	3753	14,861
With ,, .	602·3	528·2	3687	14,600	4113	16,287

The tests were made with the Lewis Thompson calorimeter; and further tests have confirmed the first series. The coke figures appear to be too high and require further investigation. We have not a bomb calorimeter, which has since been recommended for the purpose.

Stretford, March 8, 1910. H. KENDRICK.

Charco.

SIR.—In your issue of the 1st inst., there are two references to charco, to which I desire to call attention.

On p. 558 a reference is made to the less weight of charco obtained in a given experiment, than a like quantity of coke would have been if treated in the ordinary manner. This is quite correct; but, in order to avoid misunderstanding, it should be added that the charco was absolutely dry, whereas the coke would have contained some 15 or more per cent. of water.

The loss of weight by continued incandescence out of contact with air is immaterial in view of the advantages gained by the process.

In his address as President of the Manchester District Institution of Gas Engineers, Mr. Kendrick suggested (see p. 580) that it might be an advantage to cool the red-hot coke in air-tight chambers. In order to avoid disappointment, I desire to say that this is an old suggestion, but does not ensure the conditions which result in the production of the peculiar class of fuel now being introduced by my Company. The method has been frequently tried, and is the subject of patents, which, however, have failed to justify themselves in practice.

March 11, 1910. For CHARCO LIMITED, T. Meylan, Secretary.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Abertillery and District Water Board Bill, Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill, Farnham Gas and Electricity Bill, Garnant Gas Bill, Gas Companies Standard Burner Bills (Nos. 1, 2, and 3), Gowerton Gas Bill, Great Grimsby Gas Bill, Matlock Bath and Scarthin Nick Urban District Council Bill, Southend Water Bill, Thorne and District Water Bill, Wicklow Gas Bill.

The Maltby and Tickhill Water Bill has been withdrawn.

The Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill, Farnham Gas and Electricity Bill, Gowerton Gas Bill, Southend Water Bill, Thorne and District Water Bill, and Wicklow Gas Bill have been referred to a Select Committee, consisting of Lord Hylton (Chairman), Earl Cathcart, Lord Lilford, Lord Templemore, and Lord Seaton; to commence sitting to-day.

The Bill introduced last session by Lord Desborough, and not proceeded with, "to determine the rights and liabilities of persons supplying water under the authority of Parliament in certain cases," has been re-introduced by his Lordship, and read the first time.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Brighton and Hove Gas Bill, Bristol Gas Bill, East Grinstead Gas and Water Bill, Exmouth Gas Bill, Exmouth Urban District Water Bill, Fylde Water Board Bill, Kingswood Water Bill, Pontypridd and Rhondda Joint Water Board Bill, Pontypridd Water Bill, Shirebrook and District Gas Bill, Slough Water Bill.

The Whitland Water and Gas Bill has been withdrawn.

The Provisional Orders applied for under the Private Legislation Procedure (Scotland) Act in respect to Glasgow and Wishaw are to be proceeded with as Private Bills. These have accordingly been presented, read the first time, and ordered for second reading.

Petitions have been presented against the Glasgow Gas Consolidation Bill by (among others) the Baillieston Gas Company and the Busby Gas Company; and against the Wishaw Burgh Extension, &c., Bill, by the Lanark County Council, for themselves and on behalf of the Middle Ward of the county.

The Brighton and Hove Gas Bill, East Grinstead Gas and Water Bill, Mallow Gas Bill, Mallow Urban District Gas Bill, and Tipperary Gas Bill have been referred to a Select Committee, consisting of Mr. Arthur Stanley (Chairman), Mr. Haworth, Mr. Guinness, and Mr. Henry; to commence sitting to-day.

Gas Purchase Proposal Dropped at Penistone.—The opposition of the ratepayers has been so emphatically demonstrated, that the Penistone Urban District Council have decided not to proceed further with the proposal to deposit a Bill in Parliament for the purchase of the Penistone, Thurlstone, and Oxspring Gas Company's undertaking.

Gas Supply of Bradford Out-Districts.—In answer to Mr. Dobson, who inquired at the last meeting of the Bradford City Council how matters stood with regard to the gas supply of Thornbury and Tyersal, Mr. Wade (the Chairman of the Finance and General Purposes Committee) said his Committee had done their best to get an interview with the Pudsey Gas Company, with a view to purchasing gas in bulk; but the Company would not entertain the proposal for a single moment. Nor could they do anything with the Drighlington Gas Company, who supplied Tong, unless they were prepared to buy them out at an exorbitant price. Negotiations were, therefore, at an end with both Companies; and nothing could be done without going to Parliament for a Bill for compulsory purchase.

Paris Water Supply.—A Blue-book lately issued by the Board of Trade contains the following particulars in regard to the water supply of Paris: The water used for domestic purposes (*eau de source*) comes from the three tributaries of the Seine—the Dhuis (east), Vanne (south), and Avre (west); and the supply for industrial and public use (*eau de rivière*) comes from the Rivers Seine, Ourcq (by the canal of that name), and Marne. Prior to 1860, the water supply was a private enterprise. It has since been owned by the City, but worked, as a *régie intéressée*, by a Company on the City's account. Water is sold by meter, and there are two charges—viz., 1s. 3d. per 1000 gallons for drinking water and 7d. for river water; but there is a fixed annual charge, ranging from 4s. 10d. to 16s. for dwellings rented under £32 per annum. The Company collect all charges and receive a percentage.

LEGAL INTELLIGENCE.

ACTION AGAINST THE LUDLOW GAS COMPANY.

At the Shropshire Assizes, a few days ago, Mr. Justice Grantham was engaged for some time, with a Special Jury, in hearing a case in which Mr. T. R. Millichamp, a confectioner, residing in King Street, Ludlow, and his wife claimed damages from the Ludlow Gas Company for injuries alleged to have been caused by their negligence.

Mr. C. F. Vachell, K.C., and Mr. Milward appeared for the plaintiffs; Mr. Powell, K.C., and Mr. Graham represented defendants.

According to the opening statement on behalf of the plaintiffs, a smell of gas was detected on the premises, and it continued for some time in spite of steps taken by the Company to stop it. The pipes in the street at the place where the smell came into their cellar were only 19 inches underground, and, moreover, had leaked for a considerable time. The smell was stated to be so bad that the plaintiffs had to leave their bedroom windows open. One Sunday morning early in May last year, when Mrs. Millichamp went downstairs, she was overcome by the gas; and her husband, who followed her, was also affected. Assistance was called, and the plaintiffs were removed into the street; the house being full of gas. Both plaintiffs were medically attended for some time, and subsequently went to Barmouth to complete their recovery. When the gas-main was examined, it was found to be fractured in two places. Evidence was given in support of Counsel's statement; one witness saying that the fractured pipe was in a corroded condition when taken up after the accident.

For the defence, Mr. Powell contended that the Gas Company were not liable, as he should be able to prove that the leakage of gas was caused through traction-engines being driven along King Street, on the day before the escape, at a speed exceeding the statutory limit. He called Mr. H. J. Dean, the Company's Manager, who stated that the subsoil in King Street was good for laying gas-mains. The depth was 20 inches, which he considered was sufficient there. He had only had one other leakage, which took place in 1906. In that year King Street was opened, and the gas-mains exposed for laying electric cables. He then tested the main, and again in 1907, with satisfactory results. He was in King Street the night before the accident, and there was no escape of gas then. When the road was taken up after the accident, he found that the two fractures in the main were quite new. He denied that the pipes were corroded away. They were quite fit for use, and he should give them another thirty or forty years' life. In cross-examination by Mr. Vachell, witness said he should estimate that the pipes were thirty years old.

Other witnesses called for the defendants were Mr. B. W. Smith, Engineer and Manager of the Walsall Gas-Works, who stated that he had examined the main in question, and found it 18⅜ inches from the surface. The subsoil was very good; and there was no discolouration of it such as there would have been had the leakage of gas been of long standing. He regarded the depth as a very good one, and there was nothing improper about it. He should consider both of the fractures in the main were of practically the same date. The pipe was a very sound specimen of a well-cast pipe. Had it not been broken, he should have thought it would last from thirty to fifty years longer. The fractures pointed to a heavy traction-engine having passed over the road. King Street was most unsuitable for heavy traffic. Mr. W. Belton, the Engineer and Secretary of the Shrewsbury Gas Company, said he considered the fractures were quite recent. The pipes were of good quality. He did not agree, as a general principle, that the deeper the pipes were laid the safer they were, as it depended upon the soil. In High Street, Shrewsbury, the gas-mains were laid at a depth of 20 inches; in other places it varied from 24 to 16 inches. Questioned by his Lordship as to the cause of the fracture of the pipe, witness said it might have been done by a stone. Whereupon his Lordship remarked that the stone should not have been there. Witness said this was a matter for the Corporation. A police constable and the Borough Surveyor (Mr. J. A. Spreckley) deposed to having seen a traction-engine pass along King Street; the latter stating that he was impressed with the amount of vibration it caused. All the opening of the streets for the Gas Company was done by the Corporation. Mr. J. W. Montford, Solicitor, the Company's Secretary, said they had no one whose special duty it was to examine the mains; but the Manager walked about the streets for the purpose of detecting escapes of gas.

Counsel having addressed the Jury, his Lordship summed up, and put several points to them. On all these they found for the plaintiffs; and they assessed the damages at £82 18s. 6d. His Lordship said he agreed with the verdict, as the findings were warranted in every way.

Use of Water-Gas Tar on Roads.

In the King's Bench Division of the High Court of Justice of Ireland, Mr. Justice Wright and a Jury had before them, a short time ago, a claim by a lady cyclist against the Pembroke (Dublin) District Council for £1000, compensation for injuries sustained by her, as she alleged, through their negligence. The plaintiff was riding over a road under their supervision which had recently been treated with water-gas tar, and had not been sanded. It was contended, on behalf of the Council, that the use of water-gas tar was a reasonable method of treating the road, that the work had been properly done, that sanding was unnecessary, that notice-boards were on the road to warn persons of its condition, and that the plaintiff, if she had not been negligent, took the ordinary risks which a cyclist must take in passing over a newly-tarred road. For the plaintiff, however, it was argued that the road was in a dangerous condition, and that the Council had not taken reasonable and proper care in tarring it. The Jury found that the road was dangerous, and awarded the plaintiff £250 damages. Referring to the case in a recent issue, the "Surveyor and Municipal Councillor" said: "The principle of law which underlies this decision is that, though a local authority are not liable for a mere omission to repair a highway, they are nevertheless liable for any injury or damage caused by any act done by them on a highway."

MISCELLANEOUS NEWS.

GAS COMPANIES AND THE PORT OF LONDON RATES.

Manufacture of Coke.

During the inquiry last Tuesday into the rates proposed by the Port of London Authority—Lord ST. ALDWYN presiding—various claims to special exemption were heard. Among these were the cases of the Commercial Gas Company and the Brentford Gas Company; their suggestion being that, according to the Provisional Order under consideration, the trade of the Medway and Swale would be deprived of the exemption under section 43 of the Port of London Act. They asked that their trade with the Lea in the case of the Commercial Company, and Southall in that of the Brentford Company, which are outside the Port of London, should be exempt.

Mr. FREEMAN, K.C., who appeared for various gas companies, including the South Metropolitan and Commercial, alluded to goods passing through the Port to and from places on the Medway and Swale. He stated that the wording of section 43 of the Act was: "Nothing in this Act shall be construed as imposing any dues." These were the important words in the section. Turning to clause 4 of the Order, it set forth that "subject to the provisions of this Order, and to the exemptions and rebates set out in the schedules to this Order, and to any further or other exemptions or rebates allowed by the Port of London Authority under section 13 of the Port of London Act, 1908, the Authority may demand and take, in respect of all goods imported from parts beyond the seas or coastwise into the Port of London, or exported to parts beyond the seas or coastwise from that port, port rates not exceeding the rates specified in the schedules to this Order." Counsel thought the intention was that the Order should preserve the same exemption as was given in the Act. But it was not so worded; and if it passed as it now was, it would be competent for the Port Authority to charge the full rates on goods sent to, and going from, places on the Medway and Swale, though the clear intention of the Port of London Act was that they were to be exempted. If the Order followed the spirit and not the wording of the Act, it would be a mere matter of drafting.

Mr. J. D. FITZGERALD, K.C., for the Port Authority, said that, as far as he was aware, there never had been any intention of altering the exemption given by section 43 in respect of the Medway and Swale, which was granted in the interests of the persons carrying on business on these rivers which were outside the Port of London.

Mr. FREEMAN said his clients sent thousands of tons of coke to the cement manufacturers on the Medway and Swale.

Mr. FITZGERALD repeated that, so far as he knew, there never was any intention of altering the provision put in in favour of the rivers named.

Mr. FREEMAN suggested that words should be inserted to make the matter quite clear.

Mr. R. J. N. NEVILLE, who appeared for up-river gas companies, outside the limits of the Port of London, urged that they should be treated in exactly the same way as they were being dealt with in section 43. They were outside the limits just as were the Medway and the Swale. They also sent their coke to cement manufacturers.

Mr. FITZGERALD stated that the point had been raised before the General Committee. The Swale and Medway were just at the mouth of the Thames, and it was a nominal user of the port. But the point in regard to the up-river gas companies was different. These places were not within the port; but nevertheless the coal they imported travelled up the whole length of the river. If such an exemption as that asked for were allowed, the whole of the coal trade of London, or the larger portion of it, would be transferred outside the limits so as to get the exemption. Coal destined for the western districts of London would be transferred to the Grand Junction Canal. The matter was considered before the General Committee, and they refused to extend the exemption either to coal or other articles taken up the River Lea, for the reason that all of them had the benefit of the port. On behalf of the Authority, he could not consent to section 43 being altered.

The CHAIRMAN: Section 43 of the Act would have to be preserved.

Transport of Coal and Residuals.

When the proceedings were resumed on Thursday, further claims for exemption by gas companies were heard.

Mr. FREEMAN, for the South Metropolitan and the Commercial Gas Companies, said he would only have to trouble his Lordship with practically one case, because the circumstances were exactly the same as regarded both the Companies. It was merely a question of the quantity of coal they took and the degree to which they were affected. He thought some of the remarks he had to make would cover the case of the Gaslight and Coke Company also, whom Mr. Neville represented. The actual import of coal by the South Metropolitan Company was 1½ million tons per annum; and of the Commercial Company, 200,000 tons. Therefore it became a very serious question for them if any further charge in addition to the present charges was to be put on a commodity which was essential for carrying on their trade. There were two matters to which he desired earnestly to draw attention, because they were the key to the whole of their position. At the present time the Companies were paying very large sums under existing legislation for things that were practically of no benefit to them whatever. Under the additional rate which was put on in 1908 as a permanency, they paid £1234 a year; they would also have to pay in respect of the additional registration of the vessels £200 a year further, instead of the few shillings which they had to pay at the present time. Then came this Provisional Order, which sought to impose upon them an exceedingly onerous extra duty in respect of works which would not contribute one farthing of benefit to the Gas Companies. The extra money which was to be raised was to be devoted to two objects—improving the docks and improving the channel.

So far as the docks were concerned, his Companies did not use them. Their coal was all landed at their quays on the river, and did not go through the docks at all. As regarded the channel of the river, that was amply deep enough at the present time for every vessel which brought coal to the Gas Companies. They would not derive one halfpenny of benefit from any deepening to enable their vessels to come in, because they were of the right size for their works. Besides coal, they were to be charged a considerable amount on residuals. On the figure for residuals, they would be paying a further sum of £930; so that they would be actually paying to the Port Authority about £2360 in respect of works which would confer no benefit whatsoever upon them. If the figures which were suggested by the Port Authority were to be charged upon them, they would be subjected to an extra charge of something like £5000 a year. Was that fair or just? If the ordinary trader had an extra charge put upon him for the material which he had to consume in his district, he could put the additional charge upon the people who took the product from him. The Gas Companies could not do this, because they were subject to a sliding-scale; and if they found it necessary to raise the price of gas by reason of having to pay more for the coal, they would themselves have to bear a considerable share of the extra payment. They could not put it upon their customers. While the trader could shift his place of business elsewhere, this tax would not fall upon him. The Gas Companies, however, could not do this, because they were bound by Statute to put their works on a particular spot. Therefore they were entirely at the mercy of the Dock Authority; and it would be quite competent for them to put a very large price indeed upon their coal, and the Companies could not say a word. By the action of the Gas Companies in introducing gas cooking they had enormously reduced the smoke of London, and had considerably reduced the fogs which so greatly hampered the trade of the Port of London. The South Metropolitan and Commercial Companies could not take their coal by rail, because there were no facilities. He only proposed to call one witness, because what he said as to the South Metropolitan Company would apply also to the Commercial Company.

Mr. *Charles Carpenter*, the Chairman of the South Metropolitan Gas Company, examined by Mr. W. L. ROSTRON, said his Company had an area of about 55 square miles. The consumers numbered about 360,000, and some 250,000 were slot-meter consumers. The latter were chiefly members of the working classes; and they used the gas for lighting, cooking, and heating. They comprised the poorest class of residents in South London. His Company imported about 1¾ million tons of coal per year. This was all brought coastwise from the North with a very slight exception; and it was dealt with in the river without coming into dock. A small proportion, for one of their oldest works, was dealt with at the Surrey Commercial Dock. With this exception, the whole of it was dealt with at their own premises. They had no facilities for bringing coal by rail. They also exported large quantities of coke, sulphate of ammonia, pitch, creosote, and other residual products, which were the subjects of taxation under this Order. In dealing with the residuals, they did not make use of the docks—only to a small extent at the Surrey Commercial Dock. The proportion of coal would be about 8 per cent., and ammonia and other residuals—apart from coke—would be about the same figure. Coke would be perhaps about 2 or 3 per cent., or even less.

The CHAIRMAN: Can you give me some idea of the total value of the coal you import and the residuals which you export in the course of the year. Is it about £1,100,000?

Witness was understood to say that it varied. Sulphate of ammonia fetched £12 a ton, and pitch 30s. The figures were made up of so many items. The value of the coal they imported was about 8s. 6d. f.o.b. in the Tyne. It would cost them about 11s. 6d. a ton in the Thames at present prices, or those ruling during the last twelve months. They had no railway-borne coal.

In further reply to Mr. ROSTRON, witness said that, apart from the dues, his Company had to pay considerable charges under the Port of London Act. The tonnage dues were doubled in 1904, and they paid an extra amount. They were made permanent under the Port of London Act. There was an extra ½d. a ton on the ships bringing coal to London. They used to pay ½d. a ton on the net tonnage, and they now paid 1d. In 1909, they paid about £1200 a year under the extra duty. The ships that brought their coal to London were of shallow draught; and there was no need for deepening for them. They would also have to pay extra charges under this Order in connection with registration fees on river craft. They owned a large number of barges, and they had to pay on these. Apart from any rise on goods, they paid about £1400 a year towards the upkeep of the port.

Mr. ROSTRON: As regards the charges on your residuals, so far as they are concerned, I understand you do not claim exemption?

Witness: No; we are quite willing to put these in with other goods exported. The only thing is that they should pay a fair rate.

So that if what you ask—the exemption of your coal—is granted, you would still be paying about £2500 a year towards the port, although you get no direct benefit out of it?—That is so.

Witness went on to say it was quite true they had a monopoly in the supply of gas; but they had no other monopoly. They had at the time their original monopoly was given, because it was the only practicable means of lighting. But now they were in keen competition with electricity. So as regards a great deal of the lighting, they had not a monopoly. Where they had a monopoly was the supply of gas by slot meters to the poor man. More than one-third of their gas was supplied to the very poor. In this case he thought they had a monopoly. Then, with regard to the dues, they made no objection to the proposal to increase the dues which were chargeable for the deepening of the river. They derived no advantage from it; but they raised no objection. In their case, they would get nothing whatever by way of increased accommodation for the extra charges proposed. What they got on the river that was necessary for their business they already paid for.

Replying to further questions by Counsel, witness said that, under the sliding-scale, any increase in the cost of production would be divided between the shareholders and the consumers. The loss to the shareholders would be comparatively small; the bulk of it would fall upon the poorest consumers. As regarded the interests of the Company, it was against their policy to raise the price. They had tried very hard to keep down the price for a great number of years; and he thought he might say that the example of the Company, under the guidance of the late Sir George Livesey, had been a good one.

Answering the CHAIRMAN, witness said that 1d. a ton would involve an extra expenditure to them of £5000 a year.

In cross-examination by Mr. FITZGERALD, for the Port Authority, witness said he had in his mind that the extra rate which was to be levied on the tonnage of ships and the registration fees for barges were not confined to the coal trade, but were universal throughout the port.

Mr. FITZGERALD: The extra charge on the tonnage of ships does not seem to have adversely affected the South Metropolitan Gas Company in any way.

Witness: They have had more money going out; but they have been able to reduce the price of gas notwithstanding.

Your experience takes you back to the time when your Company had to pay 1s. a ton on all the coal they imported into the Port of London?—That is so. Under those circumstances, the basis price for gas was much higher than at present. It was 5s. 6d. per 1000 feet; it is now 3s. 1d.

When the charge was taken off, it enabled your Company to reduce their price and add to the dividend?—It was quite a short time; and that was corrected in 1900, when we went to Parliament. It was done in 1889, and was corrected in 1900.

You had eleven years during which you had a substantial benefit?—In the proportion of five-sixths to the consumers and one-sixth to the shareholders.

Supposing this impost had remained, it would have amounted to something between £50,000 and £60,000 a year?—A shilling a ton, yes. The whole conditions of gas supply have entirely changed in London.

And the shareholder in the Company is much better off than he was?—I think he is not. The stock is not so high. It was 130, and it is now 122.

Mr. NEVILLE, who appeared in support of the objections on behalf of the Gaslight and Coke and the Brentford Gas Companies, stated that the former had an area of about 74 square miles, mostly north of the river, but also south of the river adjoining the South Metropolitan Company. Their chief works were at Beckton. The Brentford Company were at the other end of the port. He did not propose to call any evidence. The chief points had already been given. The principles were the same for all the Gas Companies. He might call attention to the fact that the Gaslight and Coke Company might be taken as about double the size of the South Metropolitan; so that the figures given by Mr. Freeman were, roughly speaking, about double also. The Brentford Company were rather smaller than the Commercial Company. The total trade of the Gaslight and Coke Company inside the port was about two million tons—of course, chiefly coal, which was about 1¾ millions. The total trade of the Company was about 165th part of the entire trade of the port; and 333 millions was given as the total trade of the port in 1907. The Brentford Company's trade was very much similar; but this trade had one characteristic which differentiated it from the other—that it was above Kew Bridge. Mr. Fitzgerald had alluded to Kew Bridge tolls. About 100 or 200 yards beyond, there was an extra toll; and this came to £800 a year on the Brentford Company. The other works which the Company had were at Southall, on the Grand Junction Canal. The entrance of the canal to the Thames was a few hundred yards higher up than Kew Bridge; so that the whole of the coal had to pay the extra toll which was put on for the purpose of keeping up the towing path—a path that was never used by the Brentford Company at all. The total tonnage of coal into the port was about 8,800,000 tons. His two Companies imported nearly 2 million tons between them. The estimate of the Port Authority was that coal was to pay £50,000 out of the total which was to come from the river trade. It was about 40 per cent—it had to pay practically 18s. 1d. in the pound of the total value derived from the river traffic. If they dealt with coal alone, the value of the coal was about 1·3 per cent. of the total values of the commodities of the port, which were given at 333 millions. It was about 3d. in the pound of the total value. Yet it was asked to pay £50,000, which was 15 per cent. of the amount raised on the whole of these commodities. Coal was to be asked to pay eleven or twelve times as much as it ought to pay if dealt with as other commodities. The trade of the Gaslight and Coke Company worked out at 12s. out of every £100 of the trade of the port. Taking the rates, which he understood were about 50 per cent. of those mentioned in the schedule, the Gaslight and Coke Company alone would have to pay something like £16,000—£14,000 under the rates and £2000 extra for tonnage dues put on in 1905. There was 12s. for every £100 of the total trade of the port. They would have to pay about £4 19s. out of every £100. The case for the exemption of coal had been amply put before his Lordship; and he submitted that the question ought to be dealt with in a stringent manner.

The CHAIRMAN, addressing Mr. Fitzgerald, said he need not trouble him to say anything on the question as to whether there should be any port-rates on coal or not. He was satisfied there must be. The amount of these dues was a very different thing; and on this he would take time as to his decision. It seemed to him the question was a good deal complicated by the rule in the Provisional Order that coastwise traffic was to bear half of what oversea traffic had to bear. Coal was practically only coastwise traffic; and the result was that a maximum rate of 6d. per ton had been suggested in the Provisional Order, although there never could have been any idea, he supposed, that more than one-half this rate would be the maximum rate to charge on the great bulk of the coal that was imported, and probably—no doubt in accordance with what had been said by the Port Authority—not much if anything more than one-half of 3d. The placing of 6d. in the schedule had been, he thought, unnecessarily alarming to the trade. Whether it was possible or right—whether it would be right—in such a case as this of coal, which was purely coastwise traffic, to fix a rate for the article which should apply equally to coastwise and overseas traffic, he did not know. Perhaps the Port Authority would consider that.

Sir *Hudson Kearley*, the Chairman of the Port Authority, recalled, and examined by Mr. FITZGERALD, stated that, taking the rate of 6d. maximum, it automatically reduced itself to 3d.; and the Authority had repeatedly said they did not propose to raise more than half this.

Mr. FREEMAN: Do you consider that the payment of dues ought in any way to bear any relation to the benefits received? I put it to you that, in return for all the payments they make, the Gas Companies practically derive no benefit from your expenditure?

Witness: I do not agree.

You know that the South Metropolitan Gas Company bring their coal direct in steamers to their wharves. What benefit do they derive from any of the works you are going to carry out?—There is the river for their steamers.

But our coal comes direct to us, and is not on the river. Supposing these steamers go up the river, which is at present perfectly deep enough for them, and do not go into dock at all, what benefit do we derive from it?—Parliament has laid down that there shall be dues for a particular purpose; and it has been adumbrated in Parliament that the levy should be such that the incidence should be very small on any particular trade.

And did not Parliament say that the case of coal, particularly gas coal, was one that ought to be delicately considered?—I do not think the statement which has been put forward by Counsel was the attitude of the Board of Trade at that moment.

But it was the attitude of the Committee.—No, I do not think it was. The Committee decided in bulk that all these were questions for the Port Authority, subject to the schedule coming up for review before it received parliamentary sanction.

Mr. FITZGERALD, summing up the case for the Port Authority, said the question now reduced itself to whether, in view of the competition that undoubtedly existed between sea-borne and railway-borne coal, such a case had been made out that his Lordship would fix the maximum rate at something very much less than it appeared in the schedule. On this, he submitted that all the evidence, including that given by the witnesses who had been called against the proposal of the Port Authority, really established the proposition that sea-borne coal could perfectly well stand a rate of something equivalent to what was paid in other ports. With regard to what the maximum rate ought to be, that was a question for his Lordship; and it was complicated by the fact that there was one charge for overseas coal and another for coastwise. Of course, this was a question of drafting that might be easily met by putting in the original schedule a charge for overseas coal and so much for coastwise, and exempting coastwise coal from the second schedule. With regard to the Gas Companies, he really was unable to see that they had any case for special treatment at all. On the contrary, they were in a truly favourable position. Mr. Carpenter had told them that any increased charge would fall not upon the Company but upon the consumer. He (Counsel) supposed that, whatever the charge was, the consumer was the person who had to pay, and, accordingly, he submitted that, in this case, the Port Authority had acted quite reasonably in taking a maximum of 3d. for coastwise coal. The Board of Trade could call upon the Port Authority to increase their rates; and for this reason, among others, it seemed desirable that there should be a substantial margin between the actual rate and the maximum rate which they put forward.

The CHAIRMAN: I understand that the Port Authority would not object to my suggestion, if I may call it so, that the rate on coal coastwise should be the same as the rate on coal oversea; and although I should not like to decide the matter finally now—because I do not know whether any other article might be in the same position—yet I am certainly disposed to take this course. As to the maximum rate, assuming such a course to be taken, I think the proposal of the Port Authority is too high; and I would recommend to the Board of Trade a considerable reduction. I do not think there should be a large margin between the maximum rate and the rate actually charged in the case of coal, because I think the due ought to be moderate. But the article is so important in the amount it yields to the revenue of the Port Authority in any case, even on the smallest charge, that I shall postpone my decision as to the precise maximum rate until we have gone through the rest of the schedule, and see how that works out.

The inquiry was then adjourned.

Impure Atmosphere in Electric Lighted Buildings.

In view of the claims put forward by electricians that their system of lighting ensures atmospheric purity in buildings where it is in use, the following paragraph, taken from a recent issue of the "South Wales Argus," will be perused with interest by our readers. It may be mentioned that the hall referred to is lighted entirely by electricity; gas not having been taken into the building: "One much-desired condition in a public concert hall no architect has ever yet been able to secure, and that is an abundant supply of fresh air without the accompaniment of a disturbing draught. The music-loving people who wished to hear Gounod's 'Redemption' at the Central Hall were more numerons than the places in the building; and many who would gladly have found seats, had perforce to stand. Some of these had to make choice between losing the pleasure of the music or being content with standing room under the gallery. A few who arrived a little late were so enthusiastically bent on hearing the oratorio that they determined to endure this discomfort. But the most serious difficulty was that of enduring the heat, and living, without being fatally poisoned, in the terrible air which had to be breathed. The man who can really solve this problem will be a benefactor of the race of those who patronize crowded indoor gatherings. How happy were the Greeks and Romans in living in a climate which enabled them to take nearly all their pleasures in the open air, where deleterious gases had no chance of collecting and doing untold mischief."

The Laindon District Gaslight, Coke, and Water Company's works—so far as the gas portion of the undertaking is concerned—are to be sold by auction, by Messrs. A. & W. Richards (under direction of the High Court), on the 12th prox. This is one of the Companies that has attained somewhat unenviable notoriety in our columns of late; and it will be interesting to note the difference between the Directors' ideas as to the value of the plant and undertaking and that realizable under the hammer.

GERMAN CONTINENTAL GAS COMPANY.

Extended Use of Vertical Retorts.

We are indebted to Herr W. von Oechelhaeuser, the General Manager, for a copy of the report and statement of accounts for the past year which will be submitted to the general meeting of the above Company to be held at Dessau on the 23rd inst.

The report states that the hopes entertained in the preceding year, that there would be a considerable revival in the business of the Company consequent on the general improvement in trade, have not been fulfilled. The first quarter of the working year resulted in an absolute decrease of gas consumption in the German towns served by the Company. But an improvement took place later; and the net result is that the total make of gas for all the works of the Company amounted to 80,797,702 cubic metres (2,853,451,644 cubic feet), which is an increase of 3·22 per cent. on the make of the preceding year. This compares with an increase in 1908 of 3·48 per cent., and in 1907 of 8·77 per cent. The Company are able to pay the same dividend—viz., at the rate of 9 per cent.—as in 1908, though the total profit of 3,381,126 marks (£165,740) is 45,096 marks (£2210) less than in that year. The decrease in profit is attributed mainly to the unfavourable prices obtained for coke, notwithstanding that the prices paid for coal were comparatively high. The mildness of the winter of 1909-10 in Warsaw, which is the largest town served by the Company, was responsible for an abnormally small demand for coke there, with the result that the stocks had to be disposed of at low prices.

The competition of electric metallic filament lamps was not felt so keenly as had been anticipated, though they were energetically pushed on all hands. Considerable economy in gas consumption, however, continued to be effected through the increasing adoption of inverted gas-burners. The report points out that the latest small inverted burners, consuming 30 to 35 litres (1·059 to 1·236 cubic feet) of gas per hour, afford a light of 25 to 30 "candles" [doubtless hefners = 22·7 and 27·3 English candles], and are therefore the cheapest means of lighting a house at the present time, just as the high-power gas-burners are the best lights for public lighting. The consumption of gas for heating and industrial purposes continues to show considerable increase; but the Company are no longer able to draw the sharp line of demarcation which was possible formerly between the consumption of gas for lighting and for other purposes, because a uniform price of gas has been adopted in several places, and a single meter is used, instead of separate ones. Consequently, in this year's report the tabular statement of the distribution of gas consumption for lighting, heating, and power purposes which has appeared in former years has been omitted. The Company's practice, however, will be to give the ordinary domestic supply at a uniform price; but where a large quantity of gas is consumed for industrial and power purposes, and separate services and meters are not required for lighting, a lower price will be quoted to the consumer. The number of prepayment meters continues to increase, and at the close of the year was 24,318, the consumption of gas through which represented 10 per cent. of the total output.

Reference is next made to the supply of gas to balloons and the production at the Dessau works of the Company of a special light gas for this purpose. This balloon gas has hitherto been produced in the ordinary retorts, both vertical and horizontal, from ordinary purified coal gas; but experiments are being pursued for its production in settings of special construction. The new gas, to which reference has already been made in the "JOURNAL" (Vol. CVIII., pp. 180 and 533), has a specific gravity of about 0·23.

The working results with vertical retorts have been further improved, both in respect of the make of gas per ton of coal and of economy in consumption and fuel wages. The Dessau and Potsdam works of the Company have already for some time past worked exclusively with vertical retorts, and in the past autumn the whole of the Rheydt-Oderkirchen district began to be supplied entirely from a new installation of vertical retorts at M. Gladbach. A large new retort-house at the No. 2 Works at Warsaw, for a productive capacity of 3½ million cubic feet per diem, is being equipped with vertical retort-settings, half of which are already in action, and the other half will be brought into operation in the current year. A large bench of vertical settings will also be completed in the No. 1 Works at Warsaw this year. The reconstruction of the works at Frankfort-on-Oder, which is now being undertaken, will involve the adoption of the new settings there. They will also be provided in the course of the next few years at the remaining works of the Company wherever the scale of working is sufficiently large to make the mechanical handling of coal and coke for the vertical settings remunerative. The new Upper Silesian Central Gas-Works is being erected at Bismarckhütte, and will start work in the present year for the supply of ten communities with a total population of 140,000. The distributing system in connection therewith will have a length of about 28 miles. The total length of mains supplied by the Company's works amounts to 1,254,785 metres (about 780 miles). The unaccounted-for gas fell from 6·49 per cent. in 1908 to 5·93 per cent. in the year under review. New contracts have been made for the supply of Rosslau, having 13,000 inhabitants, from the Dessau works, and of eight outlying townships from the Potsdam works. The negotiations which have been in progress for a long time for the renewal of the concession for the supply of gas to Erfurt have failed; but an agreement has been made for the purchase of the Company's works by the Corporation at the expiration of the present concession—viz., on the 1st of January, 1911. The payment to be made will amount to about £245,100, which is equal to the full book value of the works. There will be profitable employment for the capital thus released in the extension of the other works of the Company and in the new works already referred to.

The electricity works of the Company at Dessau have undergone complete reorganization, and new plant for alternating current of 500 volts has been erected on a fresh site, for conversion to direct current at a transformer station on the old works. The report concludes by stating that it has been considered expedient to cease with the present issue giving the tabular statement of gas made and dividends paid since the inception of the Company, and the detailed statement of accounts and working results which were formerly given. It has been found that the

publication of these figures led to false conclusions being drawn in newspapers to the prejudice of the Company in its negotiations with the municipal authorities. Consequently, the present report gives only a summary of the profit and loss account of the Company.

METROPOLITAN GAS COMPANY OF MELBOURNE.

The Half-Yearly Meeting of this Company was held at the Offices, Flinders Street, Melbourne, on the 28th of January—Mr. JOHN GRICE, the Chairman, presiding.

The SECRETARY (Mr. John Hinde) having read the advertisement convening the meeting, the report of the Directors and the accounts for the six months ending Dec. 31 were presented. The former set forth that the net profits for the half year, including £4960 brought forward, amounted to £90,740. Of this sum, £24,500 had been transferred to the reserve fund account; £3500 to the meter renewal fund, and £1500 to the gas-stoves, &c., account. A sum of £6670 had been transferred to provide for the conversion of debentures; £9500 had been set aside as provision to part meet extra expenditure on coal during the strike; and the Directors recommended the payment of a dividend at the rate of 5s. per share, amounting to £42,860, leaving £2210 to be carried forward. The working statements in the accounts showed that, under the supervision of the Engineer (Mr. Philip Holmes Hunt), 90,958 tons of coal and 44 tons of cannel had been used in the production of 972,885,000 cubic feet of gas, of which 875,691,000 cubic feet had been sold, and 889,653,000 cubic feet accounted for.

The CHAIRMAN, in moving the adoption of the report and balance-sheet, said the improvement in business disclosed in the June half had continued, and the figures for the complete twelve months compared as follows with the year 1908. The total number of meters standing fixed in consumers' premises was as follows:

	Dec. 31, 1909.		Dec. 31, 1908.		Increase.
Ordinary	78,329	..	72,970	..	5359
Slot	15,128	..	11,756	..	3372
Total . . .	93,457	..	84,726	..	8731

This showed an increase for the year of 8731. The rapid progress of the Company was largely owing to the keen manner in which the staff devoted their energies to their work. This was shown by their having in the last three years installed 24,246 additional meters; being an increase of about 35 per cent. The total quantity of gas sold in 1909 was 1694 million cubic feet; in 1908, it was 1563 millions—showing an improvement over 1908 of 8·4 per cent. The receipts from the sales of gas during 1909 were £407,866, and in 1908 £373,970—an increase in receipts of £33,896. Included in this amount were the sales of gas through slot meters, £34,071. These were in 1908 £24,099; the improvement being £9972. These figures proved that all which had been said on previous occasions as to the popularity of this system was fully justified. Having supplied several districts with their present requirements, they were now installing slots in the district of Northcote. Reference was made at the last meeting to the introduction of small cooking-stoves to meet the special requirements of slot consumers. These could be acquired by them at a low price, and on very liberal terms, on the hire-purchase system. On Dec. 31, 2461 slot consumers were using stoves, against 1630 a year ago. Of these, 1818 were supplied on the hire-purchase system, under which, by means of small monthly payments, the stoves become the property of the householders at the end of two years. The total sales of residuals during the twelve months had produced £106,618. The expenditure on coal was some £6216 in excess of the corresponding amount for December, 1908; largely accounted for by an expanding business, necessitating the use of some 5000 tons extra. Repairs at works represented an expenditure of £22,376, against £21,672 for the corresponding half year. Remarks by the Chairman upon this item on previous occasions would have led shareholders to anticipate heavy outgoings in this direction for some time to come, as they were doing, and had in front of them, much and very important alterations and improvements at the works. The balance carried to the net revenue account was £105,706. From this amount the following appropriations have been made: Reserved fund account £24,500, meter renewal fund £3500, gas-stoves, &c., account £1500, to provide for conversion of the Company's debentures to 4 per cent. per annum as from April 1, 1910, £6670, and provision to part meet extra expenditure on coal during the strike £9500. The demands upon the amount at the disposal of the Directors were thus shown to be of an exceptional and special character, and, after meeting current requirements, the sum to be carried forward to next half year was £2750 less than was brought forward from June last. With regard to the reserved fund account, it would be seen that, notwithstanding the amount of £24,500 placed to its credit, this account was only added to by some £895 as the result of the half-year's transactions. Capital expenditure, for which the reserved fund account was now drawn upon, had, owing to extensive additional reticulation, been very heavy—new mains, meters, and services having absorbed £20,280. The latter item included many items and two important works—viz., the cost of reticulating with gas-mains the new district of Elwood, St. Kilda, and providnig a very large new trunk main to strengthen the supply in the rapidly growing suburb of Essendon. The comparatively small transfer of £1500 had been made to gas-stoves account. In mentioning this, a little thought should be given to the important work done in the Stove Department, where the net sales totalled £43,677 during the past twelve months, or an increase of £5500. It had been their policy for some time to encourage the sale rather than the renting to consumers of gas-stoves. The number of stoves on hire on Dec. 31 last was 10,440, compared with 11,243 on Dec. 31, 1908—a reduction of 803. No fewer than 5422 stoves had been sold during this period. Deducting the lesser number on hire from those sold showed an increased output for the year of 4619. In 1908, they sold 3389 and rented 814 more stoves than in the previous year. Speaking approximately, therefore, they had the same number of gas-stoves on hire as they had on Dec. 31, 1907, and had sold to consumers 8800 stoves in two years—a magnificent result, on which Mr. Scotland, the Manager of the Stove Department, and his staff, could well be congratulated. The Company were not only selling large numbers of stoves, but doing their utmost, by means of tuition and in other ways, to secure to those who had them the fullest advantages to be gained by their use. The provision of £6670 to meet the cost of debenture redemption was the outcome of an important transaction which had received the attention of the Directors during the past half year. On April 1, 1910, debentures amounting to £350,000, carrying interest at the rate of 5 per cent., the principal and interest of which were payable in London, had to be provided for. The matter received very careful consideration by the Directors, and it was decided to accept an offer of £98 per cent. net for £333,500 of bonds, bearing 4 per cent. interest. They arranged for the issue of the balance (£16,500) at 4 per cent. at par, to date from April 1 next. The principal and interest were to be payable in Melbourne instead of London. Special reference was made at their last meeting to the necessity for providing additional plant and a new retort-house. The retort-house, it was stated, would probably be at West Melbourne. They were, however, then very cramped as to space for such an addition; and they had, after lengthy negotations, purchased and arranged for an additional area of about 3½ acres adjoining their works on the west. A sum of £16,500 would have to be provided out of the reserve fund for this transaction. An item of £9500 had been set aside for the extra cost of coal owing to the strike at Newcastle. What this disastrous affair would cost them it was impossible for the present to say. The Directors, the Secretary, and the Engineer had had an anxious time ever since it started; for, in order to make sure of obtaining satisfactory coal, they had to order the major portion of it from England. The Directors had arranged for the greater part of their coal requirements, at a reasonable price, for three years, commencing on April 1 next. Mr. Aaron Danks had been selected by the Directors to fill the vacancy on the Board caused by the death of Mr. Ham. By way of showing the progress gas had made, and was making, on the other side of the world, the Chairman referred to the recent report of the deputation of the Streets Committee of the Corporation of London who visited the Continent. He then moved the adoption of the report and balance-sheet.

The motion having been put and carried, a dividend at the rate of 5s. per share for the half year ending Dec. 31 was declared, and the retiring Directors and Auditor were re-appointed.

The proceedings concluded with the usual votes of thanks to the Directors and Staffs; the Directors, the Secretary, and the Engineer (Mr. P. C. Holmes Hunt) being complimented on the work they had carried out during the strike.

ILFORD GAS COMPANY'S CO-PARTNERSHIP SCHEME.

In moving the adoption of the report at the half-yearly meeting of the Ilford Gas Company on Monday last week, the Chairman (Mr. W. Ashmole) prefaced his remarks on the working of the Company by a statement in reference to the co-partnership scheme, which, as mentioned at the preceding meeting, had been receiving the careful consideration of the Directors. He expressed his pleasure in stating that the scheme had taken concrete form; and he thought the stockholders would agree with him that it would be most beneficial to all concerned. The fact of making the employees co-partners not only encouraged thrift, but gave them an interest in the Company's welfare, and an incentive to carry out the various tasks allotted to them in a thorough and willing manner, knowing full well that the advantage of good working not only benefited the Company they served, but also the Company in which they were stockholders. By giving their best talents and energy to the general interests of the Company, they helped towards its more economical working. The benefits derived by the Company by the scheme tended, of course, towards the cheapening of gas; so that the proprietors would readily see that the consumers were going to profit by the arrangement. The scheme, to put it briefly, required the signing by each employee for an agreed term (in most cases twelve months) of an agreement making him a co-partner, and entitling him to the benefits of a bonus paid on a sliding-scale varying with the price of gas. Having further explained the scheme, the Chairman said he trusted the confidence of the Board in it would be justified, to the advantage and general benefit of the three parties concerned—the Company, the employees, and the consumers. He then passed on to deal with the working of the Company in the half year, which, according to the accounts, had resulted in a profit of £7889, against £6747 before, showing an increase of £1142; and there was a sum of £9789 available for distribution. The Board had consequently been able to recommend the declaration of a dividend for the half year at the rate of 7 per cent. per annum on the "A" and "C" stocks, and of 5½ per cent. per annum on the "B" stock (less income-tax at 1s. 2d. in the pound); being an increase in each case of ½ per cent. per annum. He concluded by saying he was sure the proprietors would all agree with him that the fact of the Board being in a position to recommend this increase showed the present sound position of the Company, and would tend to further improve the value of the property. The report was adopted, and the dividends recommended were declared.

At the general meeting of Messrs. C. & W. Walker, Limited, to be held in Birmingham on the 23rd inst., the Directors will report that the profits for the year ended the 31st of January last, after charging Directors' fees and depreciation on buildings and plant, amount to £11,889. Adding the balance brought forward, and deducting the interim dividends (£3100), there remains for disposal the sum of £16,497, which the Directors recommend should be appropriated as follows: Dividend at the rate of 5½ per cent. per annum on the preference shares for the six months ending Jan. 31, £1100; dividend at the rate of 10 per cent. per annum (free of income-tax) on the ordinary shares, £2000; to be added to the reserve fund (making it £35,000), £5000; to be carried forward, £8397. Notwithstanding the continued very severe depression, the Directors are pleased to report that the profits have been fully maintained; and they propose to write off the whole of the goodwill (£10,000) from the reserve fund, which will stand at £25,000.

CITY AND SOUTHWARK CORONER'S ANNUAL REPORT.

Question of Disused Sewers—Fires Caused by Electricity.

In the course of his annual return for the year 1909 to the Corporation of London, the Coroner for the City and the Borough of Southwark (Dr. F. Joseph Waldo) refers to the fatal gas explosion which occurred on Dec. 30, 1908, in Grange Road, Bermondsey, as fully reported in the "JOURNAL" at the time. The questions put to the Jury, and their answers, which were given in our issue of Feb. 9, 1909 (p. 399), are reproduced. One of these suggested "an official inquiry into the condition of old disused sewers, or into the means generally of preventing any similar explosion in future;" and in connection with this subject, Dr. Waldo says he addressed the following letter to the President of the Local Government Board, dated Feb. 20, 1909.

> At the conclusion of an inquiry held by me into the death of George Henry Langley—which included an inquiry into the cause of an explosion of coal gas at Bermondsey—I advised the Jury that "with a view of preventing similar untoward occurrences in the future, it would be well to ask for an inquiry as to the prevalence of disused sewers in London, and whether it would not be desirable to fill them up, or, at any rate, to secure a free system of ventilation."
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> In answer to questions put by me, Sir Alexander Binnie and Professor Vivian B. Lewes (called by the South Metropolitan Gas Company), Mr. J. W. Restler, the Deputy Chief Engineer to the Metropolitan Water Board, and Mr. Angel, the Surveyor to the Borough Council of Bermondsey, all agreed that the leaving of uninspected sewers, like that in the Grange Road, Bermondsey, below the surface of the road, was, to quote Professor Lewes's own words, "one of the most dangerous practices that could ever be allowed in a populous city."
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> Among the questions put by me to the Jury was the following: "Would you suggest an official inquiry into the condition of old disused sewers, or into the means generally of preventing any similar explosion in future?" The unanimous answer of the Jury to this question was "Yes." As a practical outcome of the Jury's rider, I now venture to suggest that a public inquiry into the condition of old disused sewers, or into the means generally of preventing any similar explosion in future, be undertaken by the Local Government Board, with the co-operation of the London County Council, the City Corporation, and the Metropolitan Borough Councils.

Dr. Waldo remarks that the matter is an urgent one; but so far there has been no practical outcome of the Jury's rider. In fact, the majority of the Local Authorities, so it appears, are not in favour of an inquiry.

With regard to his duties under the City of London Fire Inquests Act, Dr. Waldo says: "Of the 140 fires reported, in 114 cases the cause of the fire was determined; and in only 26 fires does the cause still remain unknown. In the case of 13 fires, I have, with the expert assistance of your Electrical Engineer, been able to decide that these fires were due to defective electrical arrangements. In the course of my fire inquiries, many suggestions have been made and adopted by owners and occupiers with a view of the saving of life and property in the future. The past year is remarkable for the small number of serious fires occurring within the boundaries of the City."

NEWPORT'S UNPROFITABLE ELECTRICITY UNDERTAKING

Rates to be Increased.

In the "JOURNAL" last week, it was briefly mentioned that the Corporation of Newport (Mon.) had called in Mr. C. P. Sparks to advise them as to whether the electricity undertaking, in respect of which £9000 has been paid out of the rates since it was started, is now being worked to the best advantage, and what, if any, improvements and alterations are desirable; also, as to the desirability of increasing the plant, as indicated in the report of the Borough Electrical Engineer (Mr. H. Collings-Bishop). Mr. Sparks's report has now been received, and the following are its chief features.

After pointing out that no reserve fund has been provided to meet replacement of plant, which may or has become obsolete before the expiration of the loan periods, Mr. Sparks deals briefly with the history of the undertaking, and disapproves of the Committee's policy, adopted in 1902, for general power supply. On the other hand, he says, considering the present position, the 1909 results compare favourably with those of other undertakings of similar size and load-factor, and reflect credit on the Electrical Engineer. He says he cannot indicate any economies in the use of existing equipment. The losses with the alternating system of distribution are high, owing to the large number of small transformers in use; and the only remedy would be their gradual replacement by larger transformers placed in sub-stations supplying groups of consumers.

On the question of the scale of charges for electrical energy, Mr. Sparks makes some drastic recommendations, which mean an all-round increase. He says the present scale of charges is not adequate, and to balance accounts and provide a reserve fund to meet the renewal of plant which requires replacing before the expiration of loan periods the present charges should be raised, or modified to produce additional revenue to the amount of about £2900 on the basis of sales made to March, 1909.

The Electricity and Tramway Committee of the Corporation have considered the report, but have only come to a decision as far as the scale of charges to consumers is concerned. On this point they have not adopted Mr. Sparks's recommendation that discounts should be reduced to 2½ per cent., but have agreed that all accounts should be subject to a discount of 5 per cent. if paid within one month of the date of delivery. They have resolved that the other recommendations, which include an increase of ½d. per unit for lighting and of ¼d. per unit to large power consumers, with respect to the scale of charges, should come into force on the 1st of April.

The report was brought up for consideration at the last meeting of the Town Council, when the Chairman of the Committee, in moving its adoption, submitted a new scale of charges. After some discussion, an amendment containing another scale was adopted; and the report was passed. A proposal that the whole matter of the charges to be made for the supply of electricity should be deferred for twelve months did not find a seconder.

The ratepayers of Newport are quite alive to the serious position of affairs, to judge from a letter from the Secretary of the Ratepayers' Association (Mr. J. P. Elms) which appeared in the "Monmouthshire Evening Post" last Wednesday. Referring to the report of Mr. Sparks, Mr. Elms says: "He advises, among other things, (1) that 1 per cent. of the capital outlay should be set aside annually to provide for the renewal of plant which requires replacing before the expiration of the loan period, &c.; (2) a revised tariff estimated to produce an annual increase of £2905, sufficient to clear the present annual deficit of about £1400, and provide ½ per cent. (one-half of the requirement); (3) that £350 be set aside annually for battery maintenance; (4) that certain plant be superseded, which will bring the suspense account for this item up to about £12,000; and (5) that the overcharge of 12 per cent. on current for the tramways should be amended." Mr. Elms points out that the Electricity Committee have varied the recommendations in respect of the tariff, so that it will only produce an additional £2661 a year, from which will have to be deducted the £350 for battery maintenance; leaving £2311, which will be practically all swallowed up by interest and sinking funds upon the loan of £31,255 applied for by the Council, assuming 22 years for its repayment. Everything, therefore, depends upon increased consumption; but many believe that customers will be lost through the new tariff. Mr. Elms adds that before anything can be set aside for the renewal fund, the deficit of about £1400 per annum must be wiped off, the £12,000 suspense account must be liquidated, and the overcharge on the current for the tramways ought to be set right. After all this, how many years, he asks, are likely to elapse before the renewal fund is started?

Another matter dealt with by Mr. Elms is the assessing of the electricity works at £1983, compared with £6406 for the gas-works; and he reminds the ratepayers that an appeal to Quarter Sessions or the High Court of Justice would compel the immediate removal of this injustice. He also points out that the Local Government Board are of opinion that gas is cheaper than electricity for public lighting, and will not sanction loans for the extension of public lighting by electricity excepting where it is proved that, in consequence of special local circumstances, gas is unmistakably dearer.

VALUE OF SCIENCE IN THE GAS-STOVE INDUSTRY.

Record Profits of John Wright and Eagle Range.

The very satisfactory report noticed in the "JOURNAL" last week, which the Directors of the above-named Company presented to the shareholders on Thursday, fully justified the pleasure expressed by the Chairman (Mr. S. Sanders) in moving its adoption. The period covered—the twelve months ended Dec. 31—was a record year in the history of the Company's operations, both in the amount of business done and of profit earned; the latter being £55,052 against £54,455. From this amount, in addition to paying the dividends, the Directors proposed to carry, as last year, £8000 to the reserve; bringing it up to £57,000. Beyond this, the amount of cash in hand and at the bank at the close of the year was £52,603, compared with £44,347 at the corresponding time in 1908. Another satisfactory feature in connection with the undertaking is that the total of the Company's investments exceeds by some £5000 the amount of the entire preference shares. The means by which these excellent results had been achieved formed the key-note of the speech of the Vice-Chairman (Mr. H. James Yates), in seconding the motion. In the first place, the Company had to face severe competition; and this necessitated a thorough reorganization of the business, not only as regards the works, but also on the commercial side. The introduction of a new equipment of machinery and plant on altogether different lines, and the adoption of manufacturing methods entirely fresh in the gas-stove trade, made substantial progress last year; and Mr. Yates pointed to the result of the trading, as shown by the accounts, as an index of the advantage to the Company which these changes had already produced. So radical had the alterations been at the works, that if anyone who had not visited them for two years were to walk round now, he would scarcely be able to recognize them. With regard to the future, he thought he might say that, with their actual equipment and what was in progress, they had no reason to look with other than full confidence upon the prospect of the keenest possible competition. Having referred to the occupancy by the Company, early last year, of the whole of the additional buildings acquired from the Sutherland Meter Company, Mr. Yates went on to say that among a considerable number of new inventions brought out by the Company during the past two years was a development in gas-fires which had completely revolutionized this section of the gas-stove industry, and rendered obsolete the types of fires hitherto in use. This had naturally added to the Company's prestige, and been very valuable to them. One feature which had contributed largely to this and other developments in their gas apparatus, was the great prominence they had given to the scientific side of the business—indeed, it might be said that science had now become its backbone. The new testing-rooms and physical and chemical laboratories [described and illustrated in the "JOURNAL" for the 19th of October last] had been in full operation for the past year; and the research work carried on there had already borne its full share in conducing to the results which the Directors had been able to show. The report was adopted.

The Gas Desulphurization Company, Limited, is now in liquidation, and statutory notices have been issued calling a meeting of the creditors for Monday of next week, while all claims have to be sent in by the end of this month.

IMPROVEMENTS AT THE DEVONPORT GAS-WORKS.

The Devonport Town Council had under consideration last Thursday a report by the Gas Committee recommending that application should be made to the Local Government Board for sanction to the borrowing of £6000 for works necessary to improve the quality and pressure of the gas. The Committee stated that their recommendations were based on a report by the Gas Engineer (Mr. W. P. Tervet), in which he submitted that it was immediately necessary to provide retort-bench fittings complete, mains, exhausters, washers, and workshops and mess-rooms; and that these works would effect a saving in the cost of production and conduce to an increased output of gas.

Alderman TOZER, the Chairman of the Committee, in moving the adoption of the report, said that during the past year there had been a demand for gas in excess of anything hitherto experienced; and, unfortunately, the Gas Committee had not been able to meet it as it should be met. They could not give either the pressure or the quality necessary to ensure satisfaction. They felt that it was absolutely essential that something should be done, so as to let the consumers have value for their money; and, having fully considered the matter, they were unanimous in recommending the carrying out of the Engineer's proposals. The output of gas for the year ending March, 1902, was 266 million cubic feet, and for the year ending March, 1909, it was 355 millions—an increase of 33 per cent. in seven years. In 1902, Government establishments took 19 per cent. of the total output, but in 1909 only 9 per cent.; so that, though they supplied considerably less gas to the Government, the demand for it in other directions had grown considerably. The Engineer estimated the savings effected by the works proposed would be more than double the cost of the loan. If the Corporation could give a more satisfactory supply of gas, it was undoubtedly their duty to do it. Of course, the Committee had a reserve fund; but until it reached £10,000 they did not think it should be drawn upon for such improvements as those proposed.

Alderman BLACKALL, in seconding the motion, said the work suggested should have been taken in hand years ago. It really ought to have been done before the works came into the possession of the Corporation; it was urgently needed for the economical production of gas.

After some remarks, the report was adopted.

BURTON-ON-TRENT GAS SUPPLY.

The Monthly Meeting of the Burton Corporation was held last Wednesday. In moving the adoption of the Gas and Electricity Committee's recommendations, Alderman Lowe referred to the fact that the Committee recommend that Mr. J. F. Bell, of Derby, be again appointed Consulting Engineer for another twelve months on the same terms as before, and that he be paid a special fee for carrying out the reorganization of the gas-works.

In connection with the reconstruction of the gas-works, the Gas Committee have entered into the following (among other) contracts for the first section of the scheme: Messrs. Graham, Morton, and Co., of Leeds, for the erection of ten Klönne regenerator retort-settings, £2070; Clayton, Son, and Co., of Leeds, for the construction of retort-bench mountings for ten beds in the new retort-house, £2870; local contractors to build the new retort-house, &c., and to erect the retort-bench, at the total sum of £3738, and a coal-handling plant at the sum of £1295; and W. J. Jenkins and Co., of Retford, to erect the retort-house roof, steel-work, floor girders, cross girders, overhead coal storage hoppers, for ten beds in the new retort-house, coal-breaking plant, coke-conveyor, and stoking machinery for £5647. The first three contracts are duly completed, the fourth is expected back completed in a day or two, and the last contract will be sent to the Contractors as soon as the plans are received from the Engineer. The total amount of the tenders accepted last week was £15,620. As previously stated, the work is to the designs of Mr. Bell; while Mr. A. E. Ruffhead, Assoc.M.Inst.C.E., who superintended the gas-works reconstruction at the Ayres Quay Gas-Works, Sunderland, is helping Mr. R. S. Ramsden, the Assistant Manager, with the supervision of the work at Burton.

BURSLEM CORPORATION GAS SUPPLY.

The Past Year's Working.

At the Meeting of the Burslem Town Council on Monday last week, the accounts of the Gas Department for the year ended Dec. 31 were read in draft form. The revenue account showed that the sale of gas (including public lighting) produced £20,185; the other items making a total of £27,639. On the expenditure side, the manufacture of gas cost £13,790; distribution, £2771; and other items made a total of £20,622—leaving a gross profit of £7017. This was carried to the profit and loss account, and there was paid out of it interest on loans £3392, fifth payment to the sinking fund to repay second instalment of Admiralty loan, £1171, transferred to reserve fund (being the amount of principal paid off loans during the period) £1131, on new show-room £230—leaving a net profit of £1093. There was a balance on Dec. 31, 1908, of £14,273, out of which there was transferred to the general fund in relief of the rates £1200, and a contribution of £5000 was made towards the cost of new municipal buildings; leaving £8073. This, together with the net profit for the year of £1093, made £9166. The balance-sheet showed a total capital expenditure of £124,572; stocks on hand, £7540; gas and meter rental, £6718; cash in hands of Treasurer, £905; sinking fund investments, &c., £6470; these sums, with the cash in hand, making the total £146,214. The liabilities were: Sundry loans, £84,361; interest accrued and unpaid on loans to date, £856; sundry tradesmen, £5299; due to Treasurer on current account, £2884; general fund (being balance of amount voted in relief of rates), £600; sinking fund, £6407; reserve fund, £34,638; new retorts reserve fund, £2000—leaving a balance of £9166.

The Gas Committee recommended that the Council should express their highest appreciation of the manner in which the duties of Gas Engineer and Manager had been discharged by Mr. Edward Jones during the past four years, and the fullest satisfaction with the results obtained and the general conduct of the undertaking; and that a copy of the resolution, under the seal of the Council, should be handed to Mr. Jones.

Mr. Mitchell, the Chairman of the Gas Committee, in presenting their minutes, stated that during the past year the output of gas had been 208·8 million cubic feet, compared with 211 millions in 1908 with three months of Wolstanton. The works had been continued under full strength, and the retorts had been well used. The show-room, which was completed last year, was repaying them. They made a profit of £330, which showed that the step had been in the right direction. Residuals and other things were rather low; but prices were increasing, and he hoped the works would continue to do as well in the future as they had done in the past.

Mr. Wade congratulated the Committee upon the success of their efforts, and said that personally he was glad they had expressed satisfaction at the way in which Mr. Jones had done his work. Only those who had had anything to do with the Committee and their operations before the appointment of Mr. Jones had any real conception of the great change which had taken place. He hoped the excellent work done by the Burslem Town Council would be fully recognized and acknowledged by the new authority when it came into operation.

The minutes were passed.

THE OUTLOOK FOR GAS COAL.

[From the "Iron and Coal Trades Review," March 11.]

It is the custom to arrange contracts for gas coals for twelve months from July 1, and the negotiations between the collieries and the works are usually entered into during May and June. But this year there are indications that many inquiries will be made at a much earlier period. In fact, there are already several in the market, which tends to show that gas managers are anticipating advanced prices. Moreover, offers of an additional 6d. per ton have already been made for renewals; but at present collieries will not entertain them. The Colliery Owners' Association, which includes most of the numerous large gas coal producing collieries in South Yorkshire, Lancashire, and Derbyshire, has agreed not to accept orders for delivery up to the end of June next at less than 1s. per ton advance, and not, at present, to quote for contract renewals for twelve months from July 1.

So far as can be learned at the moment, the Association is likely to ask 1s. 6d. per ton advance on gas coals for contract renewals, and a proportionate advance on gas nuts and slacks. Much depends on the advances quoted by Durham collieries, the outputs of which are likely to be affected by the operation of the Mines (Eight Hours) Act in a greater degree than in the case of collieries in the Midlands, many of which had only turned eight hours previous to the passing of the Act. Last year the price reductions accepted by Durham collieries were such as to put the participation in orders by collieries in the Midlands—so far as the London water-side gas companies were concerned—practically out of the question. The terms of the London gas companies' contracts, being usually the first to be negotiated, are taken as a basis for renewals at provincial towns; and if, as is stated, Durham collieries quote advances of 2s. per ton this year, there is a chance of a good tonnage being secured by collieries in the Midlands.

Last year contracts were renewed at reductions of 6d. and 9d. per ton; and some of the large contracts were accepted at prices that could hardly leave a distinct margin of profit. The policy of collieries in taking such low rates for gas coals as compared with house coals is one which is doubly disadvantageous, since, owing to the low prices charged for gas in some large towns, its use for cooking and heating is greatly encouraged. Moreover, at many small works gas-engines are used and power produced more cheaply than by steam; whereas, if the prices of gas coals were not reduced, gas would possibly be dearer, and the demand for house coals would be stimulated. Gas engineers are, as a rule, more successful in combination than colliery owners. The former hold more closely together. At their local Association meetings results and prices are compared; and a manager can readily obtain full information of the results of any coal he wishes to use. In the coal trade, on the other hand, it has been proved that the only time a combination of owners is really successful is on a rising market, when, of course, there is no option for buyers but to accept sellers' terms. In a falling market, there is always a colliery—perhaps not in membership with the Association—ready to make concessions in order to secure a share of the contracts.

Lewes Gas Company.—At the half-yearly meeting of this Company last Wednesday, the Directors reported a profit of £2287 on the working in the six months ended Dec. 31. The balance of net revenue was £4816; and they recommended that dividends should be declared for the half year at the rate of 5 per cent. on the original and 3½ per cent. on the additional capital stock, which would amount, after deduction of income-tax, to £1397. The Chairman (Mr. M. S. Blaker), in moving the adoption of the report, said the half-year's working had been a profitable one, the increase in the gas sold being 572,000 cubic feet; while there was an addition of 30 to the consumers. They did not advance by such leaps and bounds in Lewes as was the case in some places; but they made steady progress, and he considered that the past half year was entirely satisfactory. He thought he might say the Company had been fortunate in their officers and staff. They had in Mr. Jones a Manager who devoted himself enthusiastically to the work. He had the interests of the Company very much at heart; and the conduct of the business under his management had been most satisfactory. He thought the heads of the various departments and the employees generally showed a degree of efficiency and interest in the Company's affairs which was a matter of congratulation to the shareholders. The report was adopted.

LEGAL EXPENSES OF LOCAL AUTHORITIES.

In the "JOURNAL" last week, it was mentioned that a Bill had been introduced to enable local authorities to contribute towards the expenses of legal proceedings and private and other Bills involving questions of common interest. The following are the principal provisions.

Where it appears to any local authority, called in the Bill the "first" authority, that in any proceeding to which another local authority, called the "second" authority, is, or proposes to become, a party, a question of law arises affecting the interests of the first authority or the common interests of local authorities in general, or of the class of local authorities to which the authorities concerned belong, the first may agree with the second to bear such portion of the costs incurred by the latter in prosecuting or defending the proceedings and of any costs recoverable against that authority as may be specified in the agreement.

Where it appears to any authority that, in any proceedings in relation to a Private Bill which either is, or is about to be, promoted or opposed by another local authority, or in relation to a Provisional Order or Provisional Order Bill which either is, or is about to be, applied for or opposed by another local authority, any question arises which affects the interests of the first authority or the common interests of local authorities in general, or of the class of local authorities to which the authorities concerned belong, the first authority may agree with the second authority to contribute towards the expenses of the second authority, in respect of such promotion, application, or opposition, such portion of the expenses as may be specified in the agreement.

The council of a county or of a borough are to have power to combine with any other similar council for the purposes of section 15 of the Local Government Act, 1888, sanctioning opposition to Bills, and of the County Councils (Bills in Parliament) Act, 1903, or of the Borough Funds Acts, 1872 and 1903, and to incur all necessary expenses connected therewith.

Any expenses incurred by a local authority for the purposes named are to be defrayed in the case of a county out of the county fund, and in the case of a borough (other than a Metropolitan borough) out of the borough fund or borough rate; in the case of a Metropolitan borough, out of the general rate; and in the case of any other urban district or of a rural district, out of any rate or fund applicable for defraying expenses incurred in the execution of the Public Health Acts.

In the application of the Act to Scotland, it will be subject to certain specified modifications; and it is not to extend to Ireland. It may be cited as the Local Authorities (Legal Expenses) Act, 1910; and Jan. 1, 1911, is the date provisionally fixed for it to come into operation.

PROPOSED ADDITIONAL WATER SUPPLY FOR LONDON.

Important Schemes for Storage Reservoirs.

At the Meeting of the Metropolitan Water Board last Friday, the Works and Stores Committee presented a report on the future water supply of the Metropolis, based on an estimated population of 12 millions in 1941. Taking the estimated consumption of 35 gallons per head per day, the Committee stated that the total volume of water that may be required in the year named will be about 420 million gallons a day. Two schemes had been considered by the Committee as alternative sources of the additional supply—one being the Enbourne Valley scheme, and the other the Staines scheme. The Committee recommended the adoption of the second, or "progressive," scheme, which would be carried out in stages as the demands of an increased population would require.

The complete scheme includes five reservoirs, having a total capacity of about 20,900 million gallons, and sufficient, with the existing works, to ensure during a drought as severe as that of 1898-9 and 1901-2 a supply of 35 gallons per head per day for a population of 12 millions. The new works would necessitate an intake on the River Thames some miles above Staines, and the construction of an aqueduct about 1¼ miles long. The first instalment of the works would provide and distribute sufficient water until the year 1924. The first reservoir (to contain 5200 million gallons) would be divided by a central bank into two sections. The second instalment, which should be ready by 1924, and would suffice until 1931, would consist also of a reservoir (to contain 5500 million gallons) divided into two sections, so that either could be worked independently. The third instalment would be finished by 1931, so as to provide adequate water until 1934, and would include a reservoir to contain 3500 million gallons. The fourth and final instalment, to provide water until 1941, would consist of two new reservoirs constructed at some distance from the others. Each would have a capacity of about 3350 million gallons.

The estimated cost of this scheme would be, for the first instalment, £1,983,760; for the second instalment, £1,713,640; for the third instalment, £674,080; for the fourth instalment, £1,902,230—making a total of £6,273,710. On the other hand, the first instalment of the Enbourne scheme, which would provide the water required up to 1925, would cost £3,637,560; the second instalment, to meet the requirements until 1933, £2,150,500; and the third instalment, to meet the requirements until 1941, £2,608,760—total, £8,396,820. The Committee added: "After a full consideration, we have decided to recommend the adoption of the 'progressive' scheme as being more advantageous to the Metropolis. This scheme will, in our opinion, enable the Board not only to meet the demands of a growing population for a pure and sufficient supply of water, but also to avoid any unnecessary expenditure should the growth of population not attain the proportions which have been foreshadowed."

The result of investigations by the Director of Water Examination clearly proved that, provided sufficient storage is applied to the raw water supplies by the Board and all necessary precautions are observed with regard to filtration and distribution, a uniformly safe and wholesome water supply could be secured for the inhabitants of the Board's area. Rough estimates had been made for the Committee in regard to the cost of works to meet the probable needs of the London area until 1960, and these would involve an additional expenditure in the case of the Enbourne scheme of £9,573,000 and in that of the "progressive" scheme of £7,958,000.

The CHAIRMAN (Mr. E. B. Barnard), in moving the adoption of the report, said he wanted to avoid creating anything in the nature of a scare. The schemes should be looked at in proper proportion. There was not the slightest need for anybody to fear financial danger, though the figures involved were extremely gigantic. Whatever the consequences, however, the Board were obliged to go on supplying the water needed; and they had water enough now to last the population only until the year 1920. The desirability of going to Wales for the London supply was discussed for a long time; but, though a Welsh scheme might have been very well when the Water Companies were in existence, the circumstances had totally changed, as the public money had been invested to a huge extent. The present scheme was intended as a safeguard against times of excessive drought. They were taking only surplus water; they would not alter the flow of the Thames, and their scheme would injure no one. With regard to the relative advantages of the Enbourne and "progressive" schemes, the choice of the latter had been made because under it they would move by degrees; and if they found that the population did not increase as they estimated, or moved elsewhere, the only capital sunk would be that spent on the purchase of sites for the reservoirs, which would be used as they happened to require them. If, on the other hand, the Enbourne scheme were selected, they would be obliged to build a conduit capable of taking any quantity of water that would be ultimately required, and if their customers did not increase, the expenditure would be unremunerative. They were not running any financial risk.

After some remarks, the discussion was adjourned to allow of further consideration of the report.

ABSTRACTION OF WATER FROM THE THAMES.

Dispute between the Thames Conservancy and the Water Board.

It was stated by the Chairman of the Thames Conservancy (Lord Desborough), at the meeting of that body on Monday last week, that the negotiations which had been in progress with the Metropolitan Water Board with regard to the terms for taking water from the River Thames had come to an end, as no agreement had been arrived at. The Engineers of both bodies had worked out a very good scheme, which might have settled the question for a reasonable length of time; but, in a letter to the Conservancy, the Board declined to discuss the financial basis. Mr. E. B. Barnard, the Chairman of the Board, said that under the Statute they were bound to pay a certain sum to the Conservancy. Five of the eight Water Companies had bargains with the Conservancy. The Board stepped into the position of these Companies, and whatever the bargains were, the Board were responsible for them. They could claim a given amount of water from the Thames; and if they took more, were obliged to pay for it. The Conservancy thought that if the Board took less at one of the five spots where they paid excess money for the larger quantity taken they were not to have credit for the smaller quantity they were entitled to take at the other places. Their advisers said that by engineering work, which would mean certain capital expenditure, the matter could be so adjusted that they could take the full quantity of water they required without paying any excess. They were willing to recommend the Board to make an immediate payment to the Conservancy of £40,000; and afterwards they would go on for a period approaching twenty years before they reached the limit payment of £40,000 a year, which was the full length of their tether. The Board could not think that, as representing London, they were entitled to do any more than that. The Chairman said they would have to go to Parliament, no doubt; but whether they were going there agreed or not agreed he did not think it was any use their meeting at all when the Board declined to discuss the financial basis of the agreement. The supply of water to London from the Thames involved enormous expenditure, and in return for this the Board ought to pay something which was a fair return on the capital. What that fair return was would have to be decided by Parliament. Sir Robert Buckell said he thought it should be known that in the proposed arrangement arrived at by the Engineers of both bodies very substantial advantages were shown to accrue to the Water Board; and if the suggestions arrived at were carried out, it would be to the advantage of everybody concerned. That these suggestions were peremptorily put on one side by the Board saying they would not consider any financial arrangement, was a most unfortunate thing. The whole of the money was spent in the purification and preservation of the river in the Thames Valley, and millions had been spent in this direction. If the Conservancy were to carry on the work, they must have money. The Water Board, who received pure water, should meet the Conservancy in this matter, so that the work would be carried out to the advantage of all.

Dover Gas Company.—The half-yearly meeting of this Company was held on Monday last week—Mr. Willsher Mannering in the chair. The Directors reported that, as they anticipated would be the case when they presented their report six months ago, the profits on the past half year's working were sufficient to provide the full statutory dividend, to replace the £121 withdrawn from the accumulated surplus profits to pay the dividend for the previous half year, and leave a further sum of £636 to add to the amount brought forward. They therefore recommended a dividend at the usual rate of 7½ per cent. per annum. The Chairman, in moving the adoption of the report, dealt in detail with the items in the accounts accompanying it, and stated that during the half year nothing of importance had occurred to be brought to the shareholders' notice. The report was adopted. Votes of thanks were accorded to the Chairman, Directors, and staff; and they were acknowledged by Mr. Mannering, Mr. E. C. Fielding (one of the Joint Secretaries), and Mr. Raphael Herring (Resident Engineer). The last two gentlemen spoke highly of the staff and the employees; Mr. Herring stating that the Company had succeeded in making the employees contented, and success had followed.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The meeting of the Eastern District of the Scottish Junior Gas Association, held in Edinburgh to-night, was the last for this session; the only other item in the syllabus being a joint visit with the Western District to the Falkirk Gas-Works. The session has been a very successful one; and the report of the Council shows the Association to be in a prosperous condition. To-day's meeting was carried through without any of the honorary members being present. Excellent papers were read by Mr. A. Morton Fyffe, of Dundee, upon a most successful installation of luteless purifiers which he assisted to erect in the Dundee Corporation Gas-Works; and by Mr. H. E. Doran, Chemist at the Granton Gas-Works, upon the formation of coal. Both papers were of an informative nature, and not suitable for discussion; so that the remarks following them were of a brief nature, and chiefly complimentary. A very happy feature in the report of the Council was the giving of a list of the members who had received promotion during the year. This, when read, was found to be larger than probably anyone expected, and it makes more plain the good work the Junior Association is doing. It was an added pleasure to find the Hon. Secretary and Treasurer—Mr. J. Dickson, of Kelty—in the list.

At a special meeting of the Pollokshaws Town Council on Thursday evening, Provost Macdougall reported that a further conference of local authorities interested in opposing the Glasgow Gas Consolidation Bill had been held in Glasgow on Monday; and the opinion was that the Glasgow Corporation had made no definite proposals which would justify any of the objecting authorities in withdrawing their petition against the Bill. The conference unanimously decided that, unless some reasonable definite proposals were made by the Corporation of Glasgow, the Bill ought to be strongly opposed. The meeting remitted to Provost Macdougall and the Town Clerk to join with other authorities in employing Parliamentary Agents and Counsel.

Complaints as to alleged increases in gas bills having been put forward in Edinburgh with some persistence, an official statement on the matter was communicated to the local Press on Wednesday, in which the views of the Gas Department on the subject are given. The statement opens with the remark that the public cannot have consumed more gas than had been manufactured and sent out from the works. In the months of November, December, and January of 1907-8, the quantity was 767 million cubic feet; in 1908-9, it was 733 millions; and in 1909-10, it was 794 millions. This was 8·22 per cent. over the past winter, but only 3·47 per cent. over the preceding winter, which is something less than 2 per cent. per annum. The most prominent factor controlling the consumption of gas is atmospherical conditions. The difference between a bright and cloudy afternoon affects the output to the extent of 5 per cent., and a really dull day to the extent of 10 per cent. It had been suggested that the gas was distributed at too high a pressure. It was greatly against the economy of any gas undertaking to maintain a pressure higher than was necessary in the distributory system. There were 400 miles of main pipes, and probably 1000 miles of service-pipes, in and around the district, all of which were subject to leakage; and the leakage increased fourfold with the increase of pressure. The economy of the undertaking, therefore, demanded that no greater pressure than was necessary should prevail at any time. The records of the undertaking showed that the pressure for the different periods was the same this year as in the past year, and for some years previously. Owing, however, to the greater number of dark hours—dark mornings and dark afternoons—the pressures necessary for such periods had been longer maintained; so that while the initial pressure had not been increased, the higher pressures had been maintained for a greater number of hours during the period under review, and where carelessness prevailed in the regulation of the gas-taps, useless consumption might have taken place. Advice is given as to the attention which should be paid to gas-taps, and, in particular, the information is given that in the case of a gas-fire, after it has been warmed up, the tap may be turned down by half, and the fire still give good efficiency. If consumers who had gas-fires would try the experiment for themselves, they would be convinced of the possibility of halving their gas-fire consumption.

The Edinburgh and Leith Gas Commissioners held their annual dinner on Monday evening, in the Caledonian Railway Station Hotel. The guests numbered about 130. Lord Provost Brown presided; and among those present were Councillor Montgomery and Bailie Paxton, the Convener and Sub-Convener respectively of the Gas Committee of the Glasgow Corporation. The toast of "The Corporations of Edinburgh and Leith" was proposed by Bailie Montgomery. Mr. B. Hall Blyth, of Edinburgh, in proposing the toast of "The Gas Commissioners," said he believed there was no finer installation in Great Britain, or anywhere else, than that which had been provided by Mr. Herring for the communities of Edinburgh and Leith. Judge Bryson, in responding, said that the gas consumption had gone up by leaps and bounds, and he believed that on May 15 the consumption for the year would be found to be the largest since the inception of the Gas Commission. They were doing their best at Granton to produce gas at as cheap a rate as possible. The retorts (verticals) which Mr. Herring had leave to construct a year ago were almost ready, and he believed that in the near future they would show a still further reduction in the cost. The dinner was a very successful social function.

It was announced on Tuesday that the Corporation of Glasgow proposed to insert in their Gas Consolidation Bill a clause authorizing them to acquire, by purchase, the undertaking of the Baillieston Gas Company, Limited; the price suggested being £10,000—at the rate of about £1000 per million cubic feet of gas sold annually. In the Town Council on Thursday, Mr. Montgomery, the Convener of the Gas Committee, in reply to questions, said that a Sub-Committee of the Parliamentary Bills Committee had entered into negotiations with the Company for the purchase of their works. The power to enter into negotiation was granted by the Corporation when they passed the Gas Consolidation Provisional Order. They had to negotiate with a great

THE "MAIN" GAS HEATED BOILER.

FEATURES.

Hinged Lid.

Combined Flue outlet for Steam and Gas Products.

Powerful Boiling Burners.

Galvanized Outside Casing to Economize Gas.

Strong Cast-Iron Frame and Legs.

The Boiler itself is constructed of strong Copper and Tinned Inside with Block Tin.

PRICES.

8 Gallon
42s.

10 Gallon
45s.

12 Gallon
50s.

14 Gallon
55s.

Draw-Off Cock
6s. extra.

R. & A. MAIN, LTD.,

49, Queen Victoria St., LONDON, E.C. & 136, Renfield St., GLASGOW.

number of people, including the Baillieston Gas Company, who were petitioners against the Order; and it was out of these negotiations that the question of purchase emerged. It was proposed to supply gas to Baillieston at the same price as consumers were charged in the city. The present price in Baillieston was 3s. 1½d. per 1000 cubic feet. Mr. Battersby intimated that he would move a resolution disapproving of the negotiations. Lord Provost M'Innes Shaw considered it extraordinary that the Parliamentary Bills Committee should be doing what they had been doing without the Corporation knowing anything about it. He suggested that Mr. Battersby's resolution should have precedence at their next meeting. It was quite reasonable that the Corporation should be consulted. Mr. W. F. Anderson remarked that he was a member of the Parliamentary Bills Committee, and he knew nothing about the matter. It had been dealt with by a Sub-Committee. Mr. Montgomery said that power was given to negotiate, and that the result of the negotiations would come before the Corporation next week. The Gas Committee met next day, and resolved to recommend the Corporation to seek parliamentary powers to purchase the undertaking at Baillieston, at the price of £10,000.

The Watching and Lighting Committee of the Glasgow Corporation have had before them a report by Mr. John Lindsay, Deputy Town Clerk, and Mr. S. B. Langlands, Inspector of Lighting, on the inadequacy of the stair-lighting in the city. The report states that to remedy this further statutory powers are needed. Proposals for such powers have during recent years been under consideration, but nothing definite has yet resulted. In the meantime, the only course open is that of private arrangement with owners. Mr. Langlands reported that on Dec. 31, 1907, there were 371 incandescent gas-lights in stairs; in 1908, there were 1510; in 1909, there were 5680; and on Jan. 15 last there were 6034. His only difficulty has been to get sufficient burners to meet the demand. There are some 65,000 stair lights in the city, so that almost one-tenth of the number are now incandescent gas. In addition, there were on Dec. 31 last 2005 electric incandescent stair-lights in the city. To meet the extra expense, an additional charge is made, which is subject of arrangement. It is recommended that the work of converting the lights in the stairs into incandescent gas or electricity should be extended, and that the necessity for supplying gas-burners with greater expedition be urged upon the Gas Committee.

The Gas Committee of the Dundee Corporation have been considering the subject of the improvement of the lighting of the Downfield, Lochee, and Rosebank districts. A Sub-Committee this week agreed to recommend acceptance of the offer of the Bryan Donkin Company, Limited, to provide high-pressure plant for £485, and district governors for £288.

The price of gas in Bothwell is to be reduced, as from May 1, from 2s. 11d. to 2s. 6d. per 1000 cubic feet.

The Gas Committee reported to the Carnoustie Town Council on Monday recommending that Mr. J. Wynne be retained as Manager of the gas undertaking at a salary of £200 a year, with free house, coal, and gas; and that he be not permitted to engage in private practice. The Council approved of the appointment.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 12.

Sulphate of Ammonia.

There has been a very good demand the whole week, and during the last few days a further sharp advance in prices has taken place, all available supplies being eagerly competed for. The requirements have largely been for covering old contracts; but the tone has also been stimulated by new business for both export and home consumption. The closing quotations are £12 5s. per ton f.o.b. Hull, £12 7s. 6d. per ton f.o.b. Liverpool, and £12 10s. per ton f.o.b. Leith. No further transactions have transpired in the forward position; but it is reported that there are sellers for delivery over the second half of this year, in equal monthly quantities, at a discount of 10s. per ton on spot values, without meeting any response from buyers.

Nitrate of Soda.

This article is much firmer, and holders have raised their prices to 9s. 7½d. and 9s. 10½d. per cwt. for ordinary and refined qualities respectively, on spot.

LONDON, *March* 14.

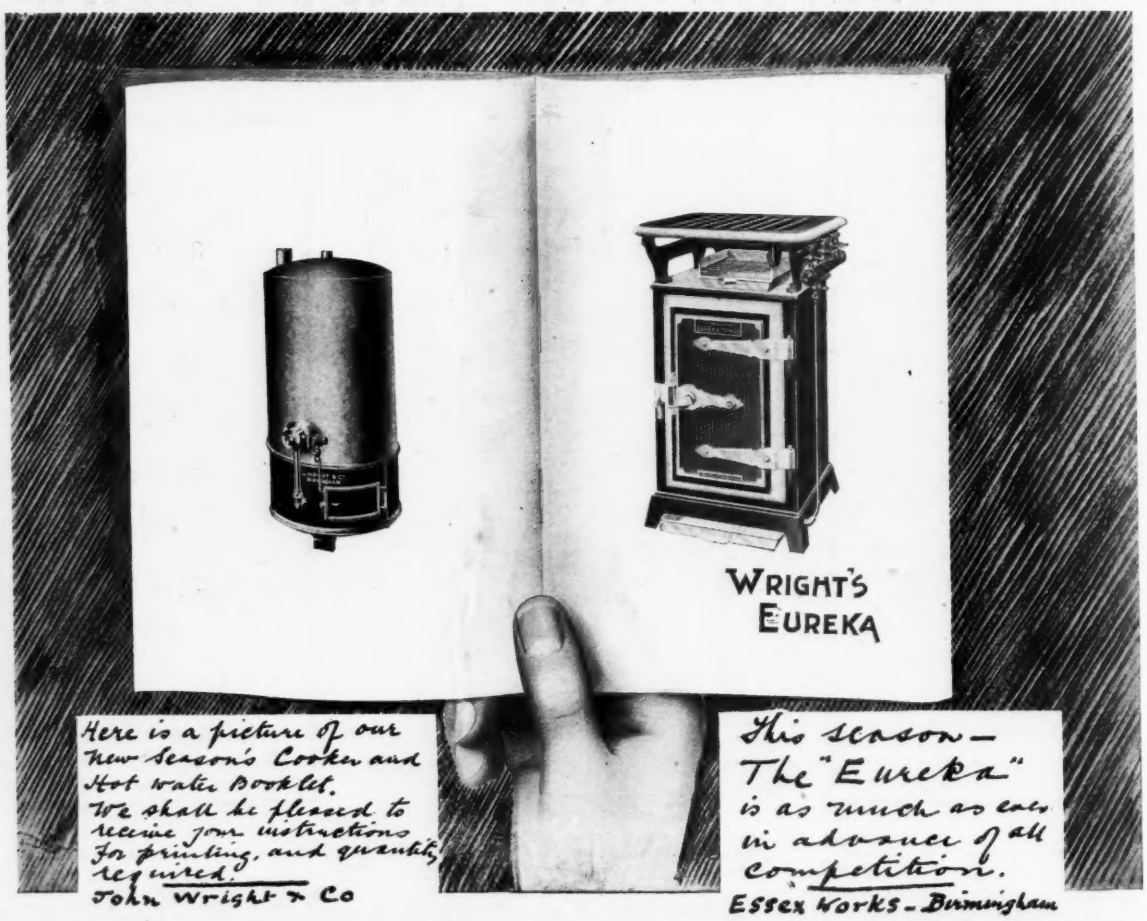
Tar Products.

The markets for tar products have been steady throughout the past week. Pitch is still firm, with a fair demand, though there is no alteration in price. Creosote remains in about the same position, and makers still look for an improvement at an early date. Benzol, 90 per cent., is very firm both for prompt and forward delivery; while 50-90 per cent. has improved correspondingly. Toluol is also in good demand both for prompt and forward delivery. Solvent naphtha is very firm indeed. There are inquiries for delivery all over the present year; but at present manufacturers do not care to quote so far ahead. There is very little business doing in carbolic acid. Crystals are neglected. Cresylic acid is firm, with an improved tendency. Tar is fetching good figures.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d. *ex* works. Pitch, London, 31s. 6d.; east coast, 31s. to 31s. 6d.; west coast, 30s. to 31s. f.a.s. Mersey ports, 30s. to 31s. others. Benzol, 90 per cent., casks included, London, 7¾d.; North, 7d. to 7¼d.; 50-90 per cent., casks included, London and the North, 8d. to 8¼d. Toluol, casks included, London, 10d.; North, 9¼d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 4d. to 4¼d.; solvent naphtha, casks included, London, 1s. 2½d. to 1s. 3½d.; North, 1s. 1½d. to 1s. 2½d.; heavy naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11½d. Creosote, in bulk, London, 2⅝d. to 2¾d.; North, 2½d. to 2¼d. Heavy oils, in bulk, 2⅝d. Carbolic acid, 60 per cent., casks included, east and west coasts, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article is exceedingly firm, and shipments during the last few days have been very heavy. To-day actual Beckton


WRIGHT'S
EUREKA
Here is a picture of our new season's Cooker and Hot water Booklet. We shall be pleased to receive your instructions for printing, and quantity required.
John Wright & Co
This season— The "Eureka" is as much as ever in advance of all competition.
Essex Works - Birmingham

could not be secured under £12 5s. to £12 7s. 6d.; and outside makes upon Beckton terms are £12 to £12 2s. 6d. In Hull, the market is £12 1s. 3d. to £12 2s. 6d.; and in Liverpool makers are asking £12 2s. 6d. to £12 5s. In Leith, £12 5s. to £12 7s. 6d. is quoted; and in Middlesbrough, £12 1s. 3d. to £12 2s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

Shipments of coal at the northern ports have been fuller, both in anticipation of the approaching holidays and to increase the stocks in doubt as to future working. In the steam coal trade, best Northumbrian steams are quiet at from 11s. 1¼d. to 11s. 4½d. per ton f.o.b.—the output being adequate. Second-class steams are 10s. to 10s. 3d.; and steam smalls are from 5s. 9d. to 6s. 9d. There are still some idle collieries; but the idleness is little felt during the time that the northern navigations are closed. In gas coal, there is a strong demand, though the deliveries on the long contracts are now naturally falling off. Durham gas coals vary in price, according to quality, from 10s. 3d. to 11s. 3d. per ton f.o.b. for the usual classes; while for "Wear" specials, from 11s. 6d. to 11s. 9d. is quoted. Among the contracts that are reported is one for over 200,000 tons of best gas coal for shipment to Hamburg, at a price not yet officially stated, but believed to be slightly below the current quotation. Another, for some 25,000 tons yearly of second-class gas coal for St. Nazaire, is believed to have been placed, at prices that allow about 10s. per ton f.o.b. for the coals. Coke is steady, with good gas coke at about 13s. 9d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

The market is steady, outputs moving away freely. Prices are being well maintained, and are quoted at: Ell, 9s. 9d. to 10s. 6d. per ton f.o.b. Glasgow; splint, 10s. 9d. to 11s.; and steam, 9s. 6d. to 9s. 9d. The shipments for the week amounted to 273,240—a decrease of 16,144 tons upon the preceding week, but an increase of 41,638 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,469,279 tons—an increase of 417,186 tons upon the corresponding period.

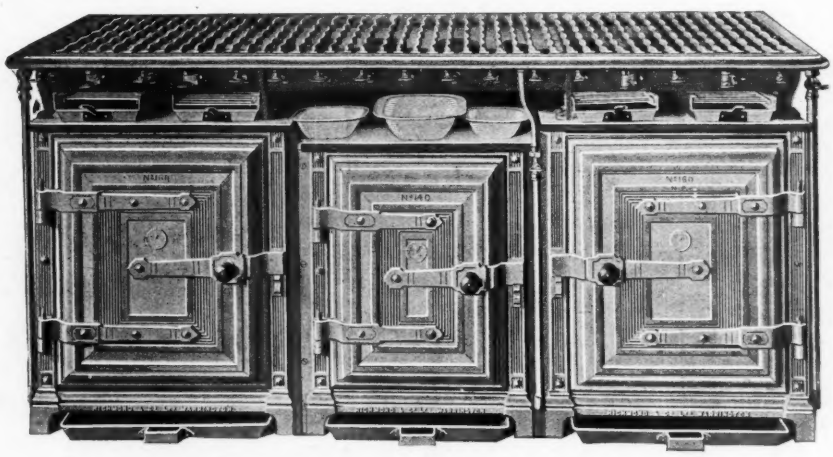
Messrs. Stewarts and Lloyds, Limited, of No. 41, Oswald Street, Glasgow, call attention in a circular to their patent branch connections for main pipes. They remark that gas and water engineers have long felt the want of an effective branch connection which could be attached to a main-pipe with a minimum of labour and the simplest appliances. This combinatinn, it is claimed, has been successfully attained by means of two patents, illustrated abstracts of which appeared in the "JOURNAL" some weeks ago (*ante*, pp. 48, 184).

Richmond Gas-Stove and Meter Company, Limited.

The annual meeting of the Richmond Gas Stove and Meter Company, Limited, was held at the offices, Warrington, last Thursday—Mr. T. Dwerryhouse (Chairman) presiding. In moving the adoption of the report and balance-sheet (*ante*, p. 684), he said he was sure the shareholders must be gratified with the results. Business, particularly in the metal trades, had been, and was at the present time, in a bad way; but the large influx of orders the Company had experienced in a limited time had taxed their resources to the utmost to execute them. The Directors had decided to erect a large new fitting-shop alongside the foundry at Grappenhall, and they hoped it would be ready for occupation early next month. Referring to the purchase of the business formerly carried on by Messrs. S. Clark and Co., the Chairman said the Directors believed it could be carried on by the present staff with little extra cost and with profit to the Company; and though they had had the business only about five months, the results so far verified this belief. The Chairman passed on to deal with financial matters, and concluded by saying he considered the balance-sheet submitted was a very good one, and showed that the Company was in a very strong condition. The Vice-Chairman and Managing-Director (Mr. Horace M. Thornton), in seconding the motion, said he thought the balance-sheet was the best the Directors had ever placed before the shareholders. Every year the Company were getting greater demands upon the scientific side of their business. He was glad to feel that this was becoming very much more a part of their policy; and to-day they had undoubtedly one of the best laboratories any gas-stove works could possess, and it was staffed in such a way as to produce the appliances gas companies asked for. The output of heating-stoves had increased nearly 100 per cent. in the present season. The loyalty of the staff was a great factor in the success of the Company's business. The report was adopted; and a dividend of 10 per cent., less 5 per cent. already paid, was declared.

Lichfield Gas Company.—The annual general meeting of this Company was held last Tuesday. Alderman G. Haynes presided, in the absence of the Chairman (Alderman H. M. Morgan), and gave a lucid account of the Company's operations in the past year. He stated that there had been a considerable increase in the revenue from the sale of gas, that coal had cost 7d. per ton less than in 1908, and that the unaccounted-for gas had still been kept at a low figure. He mentioned that the Company would be extending their operations during the ensuing summer by laying 3½ miles of mains towards the adjoining district of the Brownhills Gas Company, with the ultimate object of continuing to Shenstone. He moved the adoption of the report, and the motion was carried unanimously. The Chairman proposed a vote of thanks to the Manager (Mr. F. Key), of the success of whose work he spoke in terms of praise. Mr. Key, in returning thanks for himself and the staff, said there had only been three managers in 73 years. This spoke for itself; and he believed that, for a small Company, the staff of employees they now had would be hard to beat for good service.

Richmond's "HOLBORN" Cooker.



For SEASIDE and other large HOTELS.

¶ The third edition of our Special Catalogue giving fullest particulars of Large Gas Apparatus is at your service.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.
London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington.

Winding-Up of the Kitson Empire Lighting Company, Limited.

A petition presented by Messrs. William Still and Sons, Limited, for the winding-up of the above Company came before Mr. Justice Neville last Tuesday. Mr. Maughan, for the petitioners, said he understood there had been a meeting of creditors to consider the position of affairs, and his clients had been asked to consent to the petition standing over for a month, as there was some hope that a scheme of arrangement would be come to. He did not oppose the adjournment. His Lordship directed the petition to stand over for the period named.

Metropolitan Water Board and Farming Agreements.

In the Westminster County Court a few days ago, his Honour Judge Woodfall had before him the case of the *Metropolitan Water Board v. Arlidge*. It was a claim by the Board against William Arlidge, an owner of property in the New River, West Middlesex, Grand Junction, and other areas of the Board's jurisdiction, for about £14 arrears of water-rate. The claim was composed partly of rates owing before the Board's Act came into force, and partly of those which had become due since. Defendant had entered into a farming agreement with the Board; and the question was whether it related to the whole of the arrears, or only to those which had arisen subsequent to the Board's Act coming into operation. Mr. Giveen (instructed by Mr. George Kebbell) examined Mr. Arlidge as to the agreement entered into on Feb. 9, 1908; and Mr. A. B. Shaw, who appeared for the Board, having been heard, Judge Woodfall decided in favour of Mr. Arlidge, with costs.

Prospective Increase of Capital by the Sevenoaks Water Company.—At the recent half-yearly meeting of the Sevenoaks Water Company, at which dividends at the rates of 10 and 7 per cent. per annum were declared on the two classes of ordinary shares, the Chairman (Mr. Sydney Thompson) stated that the carrying out of extensions had caused the expenditure of more capital than had been raised by the issue of shares and debentures; and consequently the Directors would have to offer some more for subscription, so as to be able to pay for any further improvements that might be necessary.

Bristol Water Company.—At the recent annual general meeting of this Company, the Directors reported that the revenue from water-rates for the past year was £153,285; being a decrease of £1206 compared with the year 1908. This was stated by the Directors to have been caused by the falling off in the demand for water for trade and building purposes; the domestic consumption having been satisfactory. The sum available for distribution was £71,728, out of which interim dividends at the rates of £8 and £5 12s. per cent. per annum had been paid; and the Directors recommended the payment of final dividends at these rates, which would leave £4310 to be carried forward. The report was adopted.

Waltham Abbey and Cheshunt Gas Company.—At the recent half-yearly meeting of this Company, the Directors reported a surplus of £3143 available for distribution; and they recommended a dividend on the "A" shares at the rate of 8½ per cent. per annum, and on the "B," "C," and "D" shares at the rate of 6½ per cent. per annum (less income-tax). The Chairman (Mr. Alfred Kitt), in moving the adoption of the report, stated that the quantity of gas sold in the six months showed a satisfactory increase, mainly on account of the additional number of prepayment consumers. The report was adopted. At the close of the business, a special meeting was held at which sanction was given to the promotion of the Standard Burner Bill.

Underground Stream in Holborn.—An underground stream of water has been discovered in Holborn; and Messrs. A. W. Gamage, Limited, have just had an artesian well bored, giving an independent water supply to their premises. During the boring operations, the strata penetrated included concrete, blue, brown, and mottled clay, hard grey, green, red, and light blue sands, rock, sandy clay and pebbles, and chalk and flints. The total depth bored was 450 feet; 304 feet being through chalk and flints, the beds of which contained a large supply of water. The work was carried out by Messrs. Alfred Williams and Co., of Bow. The water is pumped direct in one operation to the storage-tanks on the roof of the building.

Village Water Supplies in Cumberland.—At last Wednesday's meeting of the Wigton Rural District Council, an advance was made in the arrangements for providing several villages with much-needed supplies of pure water. Six tenders were received in connection with the Hayton supply, which is to be derived from the Aspatria, Silloth, and District Joint Water Board's main; and the tender of Messrs. W. J. Minto and Co., of Wigton, was accepted. An agreement between Lord Leconfield and the Council was signed and sealed, for securing on a 21 years' lease a supply of water from a spring at the foot of Carrock Fell for the village of Haltcliffe. The parish of Boltons has approved of a scheme for supplying from the Water Board's main the villages of Brough Hill, Bolton Lowhouses, and Bolton Newhouses; the length of the main being 3½ miles.

Reduced Demand for Water at St. Helens.—At the monthly meeting of the Water Committee of the St. Helens Corporation last Wednesday, the Borough Treasurer (Mr. Brown) submitted the annual estimate. He said last year it suggested that there would be a surplus of £588; but this had not been realized, and instead they had to report a deficit of £82. The whole case was explained by the falling off in the demand for water for manufacturing purposes. The supply by meter to manufactories had brought in £12,050, against £14,000 estimated; so that there was close upon £2000 less water sold to manufactories. One manufacturer was taking less water to the amount of upwards of £1000 than formerly. The estimate showed a deficiency for next year of £817; but there was no need for alarm, because, even if the income of the Water Department was low, they would certainly not exhaust their reserve fund.

EVERY ONE REQUIRES HOT WATER WITHOUT THE COAL FIRE.

HOT WATER

FOR HOT BATHS

at any moment—day or night—without previous preparation.

MAUGHAN GEYSERS

will provide a Hot Bath in a **few minutes** at a cost of ¾d. for Gas.

GENERAL HOUSE SUPPLY

can be obtained both conveniently and economically with

THE "GACYLOTE" CYLINDER

OR

THE "HOLBORN" CIRCULATOR

which can be attached to existing Pipes.

May we send you our suggestions for supplying these to your Consumers on lines successfully adopted by other Gas Undertakings?

THE PARKINSON STOVE CO., Ltd.

(Incorporating Maughan's Patent Geyser Co.),

STOUR STREET, SPRING HILL, BIRMINGHAM. and 129, HIGH HOLBORN, LONDON.

End of the Coal Strike at Sydney.—Writing on Saturday, Messrs. W. Coward and Co. informed us that they had just received a cable from the Australian Gaslight Company of Sydney, in the following terms: "Strike has terminated. Work will be resumed next week."

Gas Exhibition at Bridgwater.—An exhibition of a novel and interesting character was held in the Town Hall, Bridgwater, last week. It was promoted by the Gas Committee, in conjunction with a local firm of house furnishers; and it was opened on Monday afternoon by the Chairman (Mr. R. Y. Foley) with a witty and interesting speech, delivered in the presence of a numerous audience. The gas-cookers shown were those of Messrs. Fletcher, Russell, and Co., Limited; and the other exhibits included almost every article required in the use of gas, including flash-light apparatus and distance lighters. At night the hall was brilliantly illuminated, and afforded striking evidence of the capabilities of gas. In the afternoons and evenings, Mrs. A. M. Collins gave cookery lectures and demonstrations. The gas arrangements were carried out by the Company's Manager, Mr. J. H. Cornish.

Riot at a Gas-Workers' Meeting.—The Paris Correspondent of the "Daily Telegraph" says: "Curious scenes were enacted at a great meeting of the gas-workers at the Labour Exchange, which ended in the throwing of benches and chairs and a general riot. There was a split recently in the Trade Union formed by the gas employees, on the occasion of the strike of the stokers and firemen. A dissenting Union was formed, and its adherents called a meeting, to which the members of the old National Syndicate flocked in crowds. The result was a battle-royal between the two camps. At the first sign of blows, the lights were put out in the hall and the doors flung open, but none of those present cared to evacuate the place. Instead they punched and pulled each other in the dark, and flung about all sorts of objects until the place was in a regular pandemonium. Matches were struck and candles lit by the combatants to distinguish their adversaries; and the riot lasted a full quarter-of-an-hour. At last the lights were again turned on, and then a large number of those present had a lamentable appearance. Their faces were bruised and bleeding, and the meeting, of course, could not be held. But before separating the most militant of the majority stood together and voted a resolution, which was simply to the following effect: 'Vive le Syndicat National.' They then went away to wash the blood from their faces."

The Morton Gas Syndicate, Limited, has been registered with a capital of £10,000, in £1 shares, to enter into an agreement with Mr. G. L. Morton, and carry on the business of gas engineers, manufacturers of gas plants for power, gas-turbines, general engineers, &c.

At the meeting of the Cookstown Urban District Council on Monday last week, a communication was read from the Directors of the Cookstown Gas Company agreeing to a reduction in the price of gas for the public lamps from 5s. 10d. to 5s. per 1000 cubic feet, to date from the 30th of June next.

Over four times the amount of 5 per cent. ordinary stock recently offered for sale by tender by the Directors of the East Hull Gas Company, at a minimum price of £105 per cent., was applied for; and tenders of present holders of stock received only a partial allotment at £106 per cent.—prices ranging up to £107.

The Wellington Tube Works, Limited, of Great Bridge, near Tipton, have issued a net price list in a form that should prove useful—helping tube buyers to overcome the present somewhat intricate discounts system. The double-fold card gives an approximate net list of wrought-iron tubes from ⅛ inch to 6 inches diameter at discounts of 35 to 90 per cent. off the standard tube trade list.

In view of the present serious position of affairs in the coal trade, attention may be called to a small pamphlet, entitled "The Conflict in South Wales," which has been published by the "Colliery Guardian" Company, Limited, of Furnival Street, Holborn, E.C. It is a reprint of the first of a series of special articles in that paper, authoritatively written, dealing with important coal trade questions affecting the public generally; and it will be followed by others. The price is 1d.

At the Sussex Winter Assizes last week, Mr. A. R. Pyne and his wife and son recovered damages to the amount of £151—being £126 for Mr. Pyne, £20 for his wife, and £5 for the son—from the Bens Gas Company, for personal injuries sustained by Mrs. Pyne and her infant and loss and damage suffered by himself, owing to the explosion of one of the Company's petrol gas-lighting machines. The plaintiffs' contention was that the apparatus did not come up to the guarantee, and that it had not been fixed and installed so as to be safe in use.

Ever on the alert to increase the business over which he has control, Mr. William Arnott, the Manager of the South African Lighting Association at Port Elizabeth, has installed plant for working up his ammoniacal liquor, and he is now putting on the market anhydrous ammonia used for cold storage and freezing purposes, liquor ammonia, and a new product—"Sala" cloudy ammonia—which is claimed to be stronger and cheaper than that which is imported. These articles are being prominently advertised in the local papers, one of which says the new venture by the Company, in the creation of another industry, is just what is required in Port Elizabeth; and the hope is expressed that it may be well supported by the public.

Messrs. R. & A. Main, Limited, have sent us one of their latest illustrated price lists, containing full particulars of their various types of cookers, all of which possess features that commend them to notice. They are of high-grade and intermediate qualities, and of sizes to suit all requirements. The cast-iron cased porcelain enamelled cookers of the firm are well known, and they maintain their popularity. The slot and packed slot cookers have been specially designed for use with prepayment meters; and the "Kent" and portable cookers are suitable for small houses or where space is limited. Plans of the hot-plates are given to show the positions of the boiling-burners and grills. The firm have had many years' practical experience in the production of cookers; and those shown in the list under notice are the outcome of it.

"VOLCANIC" (Powder). "VOLCUM" (Paste).

Andrew Stephenson,

182, Palmerston House,
Old Broad Street,
LONDON, E.C.

Tel. Address:
"VOLCANISM, LONDON."

LEST YE FORGET.

"South of England Natural Gas shares are being assiduously 'pushed' from Leeds," says the "Financial News." The writer of the paragraph adds: "Surely the canny Yorkshireman knows better than to buy them."

Messrs. Joseph Taylor and Co., of Bolton, have received orders for solid-plate lead saturators, designed either for hand fishing or for steam sulphate ejectors, for the Bromley and Crays Gas Company and the Widnes Corporation. Exactly similar orders (but for hand fishing only) have been received from the Wigan Corporation and the Exeter Gas Company.

We have received from the Davis Gas-Stove Company, Limited, an advance copy of their new "summer booklet," containing a selection of their gas-cooking apparatus, including the "New Davis" green enamelled steel cooker, modern single-cased and packed "slot" cookers, grillers, and boiling-stoves. The special features of the different stoves, which are effectively illustrated, are summarized; and a page is devoted to the articles required to clean them. The pamphlet, which is printed in colours (one being green), is quite up to the high standard aimed at in the Company's publications in past seasons.

The Electricity Committee of the Manchester Corporation have presented to the Finance Committee a supplementary estimate for £7000 for renewals in connection with the recent explosion at the Victoria Arcade in the city.

Messrs. William Coward and Co., Limited, of Finsbury Pavement, E.C., have received instructions to forward a complete gas plant for the little town of Waipawa, in New Zealand. We are glad to observe that the New Dominion is keeping pace with the rest of our distant sister branches of the Empire.

It may be remembered that about this time last year a Smoke Abatement Exhibition was held in Sheffield, in connection with which there were conferences on the subject. The exhibition was opened by Sir Oliver Lodge, the Principal of the Birmingham University, whose address on "Science and Smoke" was noticed in our columns at the time it was delivered. Several papers were read at the conference (one being by Dr. R. Lessing, on "The Calorimetric Control of the Supply and Consumption of Fuel," an abstract of which was given in the "JOURNAL" for April 13 last); and these have now been printed in pamphlet form, in wrapper, and published at the price of 6d., by the Sheffield Federated Health Association.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situation Vacant.

DRAUGHTSMAN. West's Gas Improvement Company, Manchester.

Situations Wanted.

ENGINEER'S ASSISTANT. No. 5203.
MANAGER, SUPERINTENDENT, &c. No. 5204.
SUPERINTENDENT OF DISTRIBUTION, &c. No. 5206.
WORKS MANAGER OR ASSISTANT (GAS APPLIANCE WORKS). No. 5207.

Gas Works for Disposal.

LAINDON GAS WORKS. By Auction. April 12.

Capital or Amalgamation Wanted. No. 5205.

Business for Disposal.

ANTI-VIBRATION INCANDESCENT LIGHTING COMPANY.

Plant, &c. (Second Hand), for Sale.

AIR GAS PLANT. Carrington and Co., Mile End, E.

Plant, &c. (Second Hand), Wanted.

PURIFIER, &c. Sanderson, Edinburgh.

Meetings.

BRITISH GASLIGHT COMPANY. London Offices, March 23, Twelve o'clock.
OTTOMAN GAS COMPANY. Offices, March 22, One o'clock.

Stocks and Shares.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY. April 5.
HORNSEY GAS COMPANY. March 22.
LOWESTOFT WATER AND GAS COMPANY. April 5.
SEVENOAKS WATER COMPANY. April 2.
SOUTH AFRICAN LIGHTING ASSOCIATION. No. 5199.
WORTHING GAS COMPANY. April 5.

TENDERS FOR

Coal (Also Freight and Insurance).

INVERNESS GAS COMMISSIONERS. Tenders by March 19.
MARPLE GAS DEPARTMENT. Tenders by March 23.

Coke.

WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by March 18.

Conveyor.

PETERBOROUGH GAS COMPANY. Tenders by April 8.

Exhauster.

ASHBURTON GAS DEPARTMENT. Tenders by April 12

Fire-Clay Goods.

CLITHEROE GAS DEPARTMENT. Tenders by March 26.

Gasholder, &c.

ASHBURTON GAS DEPARTMENT. Tenders by April 12.

Gas-Fitter's Work.

H.M. OFFICE OF WORKS. Tenders by March 24.

Lime.

INVERNESS GAS COMMISSIONERS. Tenders by March 19.
MARPLE GAS DEPARTMENT. Tenders by March 23.

Mantles.

BURTON-ON-TRENT GAS DEPARTMENT.

Oil for Gas Manufacture.

BARROW-IN-FURNESS CORPORATION. Tenders by March 23.

Pipes.

CLITHEROE GAS DEPARTMENT. Tenders by March 26.

Retort-Bench, &c.

CLITHEROE GAS DEPARTMENT. Tenders by March 26.

Scrubber, &c.

ASHBURTON GAS DEPARTMENT. Tenders by April 12.

Tar and Liquor.

MARPLE GAS DEPARTMENT. Tenders by March 23.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 718.

Issue	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,474,000	Stk.	Oct 14	5	Alliance & Dublin Ord.	86–88	..	5 13 8
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	98–100	..	4 0 0
200,000	5	Oct. 28	6¼	Bombay, Ltd.	6–6½	..	5 4 0
40,000	5		6¼	Do. New, £4 paid	4⅜–4⅝	..	5 6 8
50,000	10	Feb. 25	15	Bourne- mouth Gas and Water } 10 p.c.	29–30*	..	5 0 0
311,810	10	,,	7	B 7 p.c.	16¼–16⅜*	..	4 3 7
75,000	10	,,	6	Pref. 6 p.c.	15–15⅜*	..	3 17 5
380,000	Stk.	,,	12½	Brentford Consolidated	250–253*	..	4 18 10
300,000	,,		9⅜	Do. New	187–189*	..	5 0 6
50,000	,,	Aug. 12	5	Do. 5 p.c. Pref.	120–122	..	4 2 0
206,250	,,	Dec. 29	4	Do. 4 p.c. Deb.	101–103	..	3 17 8
220,000	Stk	Sep. 10	11	Brighton & Hove Orig.	218–221	..	4 19 7
246,320	,,	,,	8	Do. A Ord. Stk.	154–157	..	5 1 1
467,000	23	Oct. 14	10⅝†	British	44⅞–45⅝	..	4 13 6
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	116–118*	..	5 1 8
165,700	,,	,,	4½	Do. B 3½ p.c.	87–89*	..	5 1 2
82,278	,,	,,	5⅜	Do. C 5 p.c.	103–105*	..	5 4 9
55,000	,,	Dec. 29	3½	Do. 3½ p.c. Deb.	87–89	..	3 18 8
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	14⅞–15⅛	..	4 11 10
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98–100	..	4 0 0
100,000	13	—	—	Cape Town & Dis., Ltd.	4–5	..	—
100,000	13	—	—	Do. 4½ p.c. Pref.	6–7	+⅛	—
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48½–49¼	..	6 1 3
100,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	86–88	+3	5 2 3
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	105–108*	..	4 12 7
1,513,280	Stk.	Feb. 25	5⅛	Commercial 4 p.c. Stk.	105–108*	..	4 16 4
560,000	,,	,,	5	Do. 3½ p.c. do.	103–105*	..	4 15 3
475,000	,,	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81–83	..	3 12 3
800 000	Stk.	Dec. 10	5	Continental Union, Ltd.	97–99	+1	5 1 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	138–140	+1	5 0 0
492,270	Stk.	—	5	Derby Con. Stk.	121–123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk.	103–105	..	3 16 2
148,995	,,	Oct. 2	5	East Hull 5 p.c. Ord.	98–100	..	5 0 0
486,090	10	Jan. 27	12	European, Ltd.	24½–24¾	..	4 17 0
354,060	10	,,	12	Do. £7 10s. paid.	18⅜–19	..	4 14 9
15,141,545	Stk.	Feb. 10	4⅜	Gas light and Coke } 4 p.c. Ord.	103¾–104¼	–⅛	4 9 3
2,600,000	,,	,,	3½	3½ p.c. max.	88–90	..	3 17 9
3,799,735	,,	,,	4	4 p.c. Con. Pref.	103–105	..	3 16 2
4,193,975	,,	Dec. 29	3	3 p.c. Con. Deb.	81–83	..	3 12 3
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	95–97	..	5 3 1
82,500	,,	,,	6¼	Do. do. 5 p.c.	119–121	..	5 7 5
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	17⅝–18	..	6 2 3
131,010	Stk.	Sep. 10	7½	Ilford A and C	145–147	..	4 15 3
65,783	,,	,,	5¾†	Do. B	109–111	..	4 19 1
65,500	,,	Dec. 29	4	Do. 4 p.c. Deb.	100–102	..	3 18 5
4,940,000	Stk.	Nov. 11	8	Imperial Continental	176–178	+1	4 9 11
1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92–94	..	3 14 6
195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	120–122	..	4 18 4
561,000	Stk.	Feb. 25	10	Liverpool United A.	222–224*	..	4 9 3
718,100	,,	,,	7	Do. B	163½–165½*	..	4 4 7
306,083	,,	Dec. 29	4	Do. Deb. Stk.	103–105	..	3 16 2
75,000	5	Nov. 26	6	Malta & Mediterranean.	4⅞–5	..	6 0 0
560,000	100	Oct. 1	5	Met. of } 5 p.c. Deb.	99–102	..	4 18 0
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	100–102	..	4 8 3
541,920	20	Nov. 11	3½	Monte Video. Ltd.	12⅝–13⅛	..	5 5 8
1,775,892	Stk.	Feb. 25	4⅜	Newc'tle & G'tesh'd Con	104–105*	..	4 3 4
529,435	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	91–93	..	3 15 3
55,940	10	Feb. 25	7	North Middlesex 7 p.c.	12⅝–13⅛*	..	5 5 8
300,000	Stk.	Nov. 26	8	Oriental, Ltd.	139–141	+1	5 13 6
60,000	5	Sep. 10	8	Ottoman, Ltd.	6⅜–6⅝	..	6 5 6
31,800	53	Feb. 25	13	Portsea Island A.	134–136*	..	5 1 0
60,000	50	,,	13	Do. B.	126–128*	..	5 1 7
100,000	50	,,	12	Do. C.	119–121*	..	4 19 2
114,800	50	,,	10	Do. D and E.	100–102*	..	4 18 0
393,490	5	Oct. 28	7	Primitiva Ord.	7⅜–7⅝	..	4 8 11
796,980	5	Jan. 27	5	Do. 5 p.c. Pref.	5⅜–5⅝	..	4 8 11
488,903	100	Dec. 1	4	Do. 4 p.c. Deb.	99–101	..	3 19 3
1,000,000	10	Oct. 14	8	River Plate Ord.	17⅞–18⅛	..	4 7 8
312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	99–101	..	3 19 3
250,000	10	Sep. 29	9†	San Paulo, Ltd.	15⅞–16⅛	–⅛	5 10 9
62,500	10	,,	6	Do. 6 p.c. Pref.	11⅞–12⅛	..	4 18 0
125,030	50	Jan. 3	5	Do. 5 p.c. Deb.	50–51	..	4 18 0
135,000	Stk.	Sep. 10	10	Sheffield A	233–235	..	4 5 1
209,984	,,	,,	10	Do. B	233–235	..	4 5 1
523,500	,,	,,	10	Do. C	233–235	..	4 5 1
70,000	10	Oct. 14	10	South African	12½–12⅝	..	7 16 11
6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	120–122	..	4 9 7
1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	82–84	..	3 11 4
209,820	Stk.	Aug. 26	8	South Shields Con. Stk.	161–162	..	4 18 9
605,000	Stk.	Feb. 25	5⅜	S'th Suburb'n Ord. 5 p.c.	120–122*	..	4 12 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	119–121*	..	4 2 8
117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	121–123	..	4 1 4
502,310	Stk.	Nov. 11	5	Southampton Ord.	110–112	..	4 9 3
120,000	Stk.	Feb. 10	6⅞	Tottenham and } A 5 p.c.	133–135	..	5 1 9
453,940	,,	,,	5⅜	B 3½ p.c.	112–114	..	4 14 4
149,470	,,	Dec. 29	4	Edmonton } 4 p.c. Deb.	98–100	..	4 0 0
182,380	10	Dec. 29	8	Tuscan, Ltd.	9⅛–9⅜	..	8 4 2
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	99–101	..	4 19 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p c max.	112–114*	..	4 7 9
255,636	Stk.	Feb. 25	6⅜	Wands- worth } B 3½ p.c.	139–141*	..	4 14 0
79,416	,,	Dec. 29	3	3 p.c. Deb. Stk.	74–76	..	3 18 11

Prices marked * are "Ex div." † Next dividend will be at this rate.

APPLICATIONS FOR LETTERS PATENT.

4914.—Crombie, W. A. E., "Separation of tar and dust from hot gases." Feb. 28.
4920.—Sharpe, W. C. & W. C., jun., "Air gas." Feb. 28.
4924.—Gabbott, E. P., and Timmis, A. C., "Measuring the flow of fluids." Feb. 28.
4984.—Edgar, W., "Automatically controlling gas." Feb. 28.
4989.—Challis, J., and Stephens, K., "Incandescent burners." Feb. 28.
4990.—Challis, J., and Stephens, K., "Gas-inlet regulator." Feb. 28.
5016.—Altman, J., and the Wholesale Fittings Company, Ltd., "Gas-lamps." Feb. 28.
5033.—Bennet, J. H., "Dry meters." Feb. 28.
5062.—Browett, F., "Union for pipes." March 1.
5151.—Bland, C. W., "Inverted lamps." March 1.
5179.—Green, G. W., and Gibbons, W. P., "Charging and discharging gas-retorts." March 2.
5237.—Elliott, L. A., "Gas-ovens attachment." March 2.
5251.—Sperryn, G., "Cocks for fluids." March 2.
5262.—Société Française de Chaleur et Lumière, "Manufacture of mantles." March 2.
5263.—Lewis, W. W., "Acetylene generators." March 2.
5293.—Powell, J. & R. H., "Petrol-air gas generators." March 2.
5371.—Glover, T., "Incandescent burner." March 3.
5384.—Hanwell, H. W., "Anti-vibrators." March 3.
5406.—Withers, A. W., "Gas-scrubbers." March 4.
5418.—Robertson, J., "Gas-fires." March 4.
5469.—Robin, J. I., "Gas-burners." March 4.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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Resists 4500° Fahr. Best for GAS-WORKS.
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Telegrams: "Gasoso London." Telephone: 14 Hammersmith.

LUX'S GAS PURIFYING MASS.
See Advertisement on p. 701.
Friedrich Lux, Ludwigshafen-am-Rhein.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
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Telegrams: "Dacolight London." Telephone: 2836 Holborn.

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See Illustrated Advertisement, Feb. 1, p. 277.

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The one Machine which Discharges and Charges at One Stroke.
See Advertisement, March 8, p. III. of Centre.
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PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
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John Radcliffe, Chemical Engineer, East Barnet.

APPLICATIONS FOR APPOINTMENTS.
DO you appreciate how much success depends on well-considered and lucid presentment of your qualifications? I make a Specialty of the Preparation of Applications, and am continually receiving complimentary letters from clients. Write now for Particulars.
Herbert Greatorex, Hackney, Matlock.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

PRIVATE Company, with large and successful Plant working on their Patents and Rights to a further Valuable and Proved Process, require CAPITAL, or would AMALGAMATE with an Engineering Firm of Standing. Proposals will bear the strictest Examination.
Address No. 5205, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

THE ANTI-VIBRATION INCANDESCENT LIGHTING COMPANY, LIMITED.
IN VOLUNTARY LIQUIDATION.
THIS well-known and Established business of Gas Lighting Engineers and Makers of Greenall's Positive Measurement Meter, as at present carried on at the Albion Works, Otley, is now OFFERED AS A GOING CONCERN, with all Plant and Machinery, Patterns, Patents and Goodwill.
The Works were re-arranged Five Years ago, by the Company, and are admirably adapted for their purposes, consisting of a large, very well-lighted shed, with extensive Offices, Storeroom, and Lavatories, with small Iron and Brass Foundries attached, the whole covering an area of 3000 sq. yards, and can be obtained at a moderate rental.
Apply to the Liquidator, Albion Works, Otley.

GAS Engineer's Assistant seeks vacancy. Works or General. Excellent Qualifications and Experience in Works, District, and Office. Chemist and Draughtsman.
Address No. 5203, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Situation as Works Manager or Assistant in a Firm Manufacturing Gas Appliances. Through knowledge of High and Low Pressure Lighting and Heating; also Photometry. Excellent References.
Address No. 5207, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED by Advertiser (Age 26)—of good inventive ability, who has had Six Years Experience in a large London Gas Company; also good Commercial Training—position as MANAGER, SUPERINTENDENT, or any POSITION of RESPONSIBILITY. Good Prospects more Important than Commencing Salary. Excellent References (London preferred).
Address No. 5204, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

SUPERINTENDENT of Distribution (Age 30) of Good Address, just returned from an Appointment with a progressive Gas Company abroad, seeks ENGAGEMENT. Thorough Practical Knowledge of Gas Supply, well Informed on most Modern Methods of Meeting Competition and obtaining New and Permanent Business. Good Commercial Training. Energetic. Excellent Testimonials.
Address No. 5206, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Draughtsman Experienced in Retort House, Coal, and Coke Handling Plants.
Apply, stating Experience and Salary required, to West's Gas Improvement Company, Limited, Albion Iron-Works, Miles Platting, Manchester.

WANTED, a Purifier, Second-Hand, about 6 ft. by 4 ft. by 3 ft. with Valves, Connections, and Lifting Apparatus.
Address K. Sanderson, 23, Rutland Street, Edinburgh.

COUNTY BOROUGH OF BURTON-UPON-TRENT.
TWELVE Months' Supply of Mantles Wanted.
Full Particulars will be given to reliable English Makers on written Application being made to the undersigned.
R. S. Ramsden,
Assistant-Manager.
Gas-Works, Burton-upon-Trent,
March 16, 1910.

CAST-IRON Pipes. Spigot and Socket or Flanged. Special Quality—9 feet or 12 feet Lengths. When buying, Write us.
A. Lowcock, Limited, Shrewsbury.

GASHOLDERS—Splendid 45 feet dia- meter and New STEEL TANK, fixed Complete to Plan and Specification; also 14 feet and 16 feet Diameter GASHOLDERS, with STEEL TANKS. Can be seen temporarily erected. Re-erected Cheap for immediate Sale.
Firth Blakeleys, Thornhill, Dewsbury.

FOR SALE—One 150-Burner Complete Plant made by the National Air Gas Company, Limited. Nearly new and in Good Order. Has been little used.
Can be seen, by appointment, at Messrs. Charrington and Company, Limited, Anchor Brewery, Mile End, London, E.

PETERBOROUGH GAS COMPANY.
THE Directors of the above Company invite TENDERS for a HOT COKE CONVEYOR.
Tenders, addressed to the Chairman of the Company, Gas-Works, Peterborough, and endorsed "Conveyor," to be delivered not later than the 8th of April, 1910.
The Directors do not bind themselves to accept the lowest or any Tender.
Further Particulars from
John Barton,
Secretary.
Gas-Works, Peterborough,
March 11, 1910.

COKE.
THE Directors of the Wandsworth and Putney Gaslight and Coke Company invite TENDERS for the Removal of about 8000 Tons of Guaranteed "Wandsworth" COKE from their Works at Wandsworth, between April 1 and Sept. 30 next.
The Coke to be removed by Van or by Barge (free waterway on River Thames).
Sealed Tenders, endorsed "Tender for Coke," to be delivered not later than March 18.
The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.
Any further Information may be obtained from the Engineer, Mr. H. O. Carr.
Chas. W. Braine,
Secretary.
Wandsworth and Putney Gaslight and Coke Company, Fairfield Street, Wandsworth, S.W., March 5, 1910.

BOROUGH OF CLITHEROE.
(Gas Department.)
THE Gas Committee invite Tenders for the Supply and Erection of RETORT BENCH, RETORT FITTINGS, and STEEL MAINS at their Gas-Works.
Drawings may be seen, and Copies of Specification obtained, on Application to the undersigned.
Sealed Tenders, endorsed "Tender for Retort-Bench," &c., addressed to the Chairman of the Gas Committee, to be delivered at my Office not later than Saturday, the 26th day of March, 1910.
The Gas Committee do not bind themselves to accept the lowest or any Tender.
Robert Barrett,
Engineer and Manager.
Gas-Works, Clitheroe,
March 7, 1910.

ROYAL BURGH OF INVERNESS.
CONTRACTS FOR COAL, LIME, FREIGHT AND INSURANCE.
THE Inverness Gas Commissioners are prepared to receive OFFERS for the Supply of 10,000 Tons or thereby of CANNEL and GAS COAL to be quoted f.o.b. at Ports on the Firth of Forth, f.o.r. at Pit, and f.o.r. at Inverness Goods Station, over a period of Six or Twelve Months at the Commissioners' Option, and for Freight and Insurance on Coal from Firth of Forth Ports to Upper Harbour, Inverness. Also for the Supply of 300 Tons or thereby of SHELL LIME to be delivered f.o.r. at Inverness Goods Station.
Further Particulars and Forms of Tender may be obtained by Applying to the Manager at the Gas-Works.
Tenders, endorsed and addressed to Kenneth MacDonald, Esq., Clerk to the Commissioners, will be received up to Saturday, the 19th curt.
Gas-Works, Inverness,
March 9, 1910.

BOROUGH OF BARROW-IN-FURNESS.
SUPPLY OF GAS OIL.
THE Corporation are prepared to re- ceive TENDERS for the Supply of about 750 to 850 Tons of OIL (Price to be per Ton), suitable for the Manufacture of Carburetted Water Gas, delivered free at the Gas-Works Siding, in such Quantities and at such Times as may be required for a period of One or Two Years (at the option of the Corporation) ending the 31st of March, 1911 or 1912.
Sealed Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Oil," to be delivered at the Town Clerk's Office not later than Twelve o'clock noon on Wednesday, the 23rd of March, 1910.
The lowest or any Tender not necessarily accepted.
By order,
L. Hewlett,
Town Clerk.
Town Hall, Barrow-in-Furness.

ASHBURTON URBAN DISTRICT COUNCIL.
TENDERS are invited by the above Council for the Provision and Erection of the following PLANT at their Gas-Works.
1—A New Two-Lift GASHOLDER to be erected in an existing Masonry Tank after Dismantling the present 30 ft. by 12 ft. Single Lift.
2—A Steel TOWER SCRUBBER.
3—Gas-Driven EXHAUSTING PLANT.
4—The requisite 6-inch Connections.
The Drawings and Specifications may be inspected at the Offices of the Council, East Street, Ashburton.
Sealed Tenders for the whole of the works, endorsed "Gas Plant," and addressed to the undersigned, to be delivered at the Offices of the Council not later than Tuesday, the 12th day of April, 1910.
The Council do not bind themselves to accept the lowest or any Tender, and the Scheme is subject to the sanction of the Local Government Board.
R. E. Tucker,
Clerk to the Council.
Ashburton, Devon,
March 12, 1910.

GAS-FITTER'S WORK.
THE Commissioners of H.M. Works and Public Buildings are prepared to receive TENDERS for the Execution of GAS FITTER'S WORK to Public Buildings, &c., in the London District, for Three Years from the 1st of April, 1910.
The printed Schedule with Form of Tender may be obtained at H.M. Office of Works, &c., Storey's Gate, London, S.W., between the hours of Eleven a.m. and Five p.m. (except on Saturdays) upon payment of Five Shillings. The Sum so paid will be returned to those persons who send in Tenders in conformity with the Conditions specified below.
The Commissioners do not bind themselves to accept the lowest or any Tender.
Tenders must be delivered before Eleven a.m. on Thursday, the 24th of March, 1910, addressed to the Secretary, H.M. Office of Works, &c., Storey's Gate, London, S.W., and endorsed "Tender for Gas-Fitter's Work."
H.M. Office of Works, &c.,
March 11, 1910.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HORNSEY GAS COMPANY.

NEW ISSUE OF £5000 CONSOLIDATED STOCK,
£6500 FIVE PER CENT. PREFERENCE STOCK,
AND
£3000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 22, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 400 ADDITIONAL ORDINARY £10 SHARES,
AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 5, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

NEW ISSUE OF £32,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 5, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WORTHING GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £3473 CONSOLIDATED ORDINARY STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 5, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

In the High Court of Justice, Chancery Division,
Mr. Justice Joyce. 1909, L. No. 1586.

THE FREEHOLD GAS-WORKS
OF THE
LAINDON AND DISTRICT GASLIGHT, COKE, AND WATER COMPANY, LIMITED,

Situate about 23 miles from London, within a short distance of the Laindon Station on the London, Tilbury, and Southend Railway. The Works comprise: **Retort House** with Eight Retorts, Vertical Condenser, Cast-Iron Scrubber, Tar-Tank and Pump, Two Purifiers, with Lifting and Traversing Apparatus, **Gasholder, 400-Light Station Meter,** together with the Mains, Services, Meters, and Tools, the whole **to be sold** as a **Going Concern** and with **Possession on completion of the purchase.**

MR. WILLIAM RICHARDS, of the Firm of **MESSRS. A. & W. RICHARDS** (the person appointed by the said Judge), will SELL THE ABOVE BY AUCTION, at the Mart, London, E.C., on Tuesday, April 12th., at **One** o'clock, precisely in One Lot.

The Works may be viewed, and Particulars with Conditions of Sale obtained, of J. MONTAGUE HASLIP, Esq., Solicitor, 6, Martin's Lane, CANNON STREET, E.C.; of HARRY BARKER, Esq., Chartered Accountant, 6, OLD JEWRY, E.C., and of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

OTTOMAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, E.C., on Tuesday, the 22nd day of March, 1910, at One o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last; to declare a Dividend for the same period; to elect Directors and Auditors in place of those retiring; and to Transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 15th day of March until after the Meeting.

By order of the Board,
THOMAS GUYATT,
Secretary.

9, Queen Street Place,
Cannon Street, London, E.C.,
Feb. 22, 1910.

MARPLE URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

COAL, CANNEL, AND LIME.

THE Gas Committee of the above Council invite TENDERS for the Supply of GAS COALS, CANNEL, and BEST HAND-PICKED BUXTON LIME, as required at their Gas-Works, Marple Bridge, during the Year ending March 31, 1911.

TAR AND LIQUOR.

Tenders are also invited for the Purchase of Surplus TAR and AMMONIACAL LIQUOR produced at the Gas-Works during the Year ending March 31, 1911. The Tar and Ammoniacal Liquor will be required to be taken direct from the Works by the Purchaser.

Forms of Tender (for Coals and Cannel only) and Conditions upon which Tenders only will be received, may be obtained on Application to Mr. Jas. K. LAW, Gas-Manager, Marple Bridge, near Stockport.

Tenders, endorsed "Coals," "Lime," &c., as the case may be, and addressed to the Chairman of the Gas Committee, to be delivered at the Council Offices, Marple, by Four o'clock p.m. on Wednesday, March 23, 1910.

CHARLES F. JOHNSON,
Clerk to the Council.

Public Offices, Marple,
Cheshire, March 8, 1910.

FOR SALE—50 Ordinary Shares in the SOUTH AFRICAN LIGHTING ASSOCIATION, Particulars on Application. Will accept £12 10s. each. Address No. 5199, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SEVENOAKS WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the Sevenoaks Water-Works Company, in pursuance of their Provisional Order of 1908, as confirmed by Act of Parliament, being desirous of increasing their Capital, have resolved to issue Three Hundred 4 PER CENT. PREFERENCE SHARES of TEN POUNDS each.

Tenders are hereby invited from the Public for the same at not less than par value.

The present issue of Capital is made to provide for the Extension of Mains and other works, and also for the Repayment of Sums over-expended on Capital Account.

The Company are paying the Maximum Dividend on their Stock and Ordinary Share Capital.

Tenders are to be addressed to the Company at their Offices, Oak Lane, Sevenoaks, on or before Saturday, the 2nd day of April, 1910, and endorsed "Tender for Shares."

The Shares are Payable as under—viz.:
£2 on Application,
£3 on Allotment,
and the Balance on the 1st day of July, 1910.

Where no Allotment is made, the Deposit will be returned in full.

Forms of Tender on Application at the Company's Offices.

By order of the Board,
ALFRED GRAINGER,
Secretary.

Offices: Oak Lane, Sevenoaks,
March 9, 1910.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 23rd inst., at Twelve o'clock precisely, to transact the usual Business; and to declare a Dividend for the Half Year ended the 31st of December last.

NOTICE IS HEREBY ALSO GIVEN, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 12th inst. and RE-OPENED on the 24th inst.

By order of the Court of Directors,
A. W. BROOKES,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.
March 4, 1910.

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REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1909.

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Above the Average in Weight and Quality of Coke.
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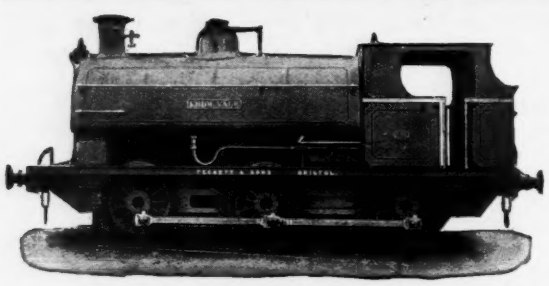

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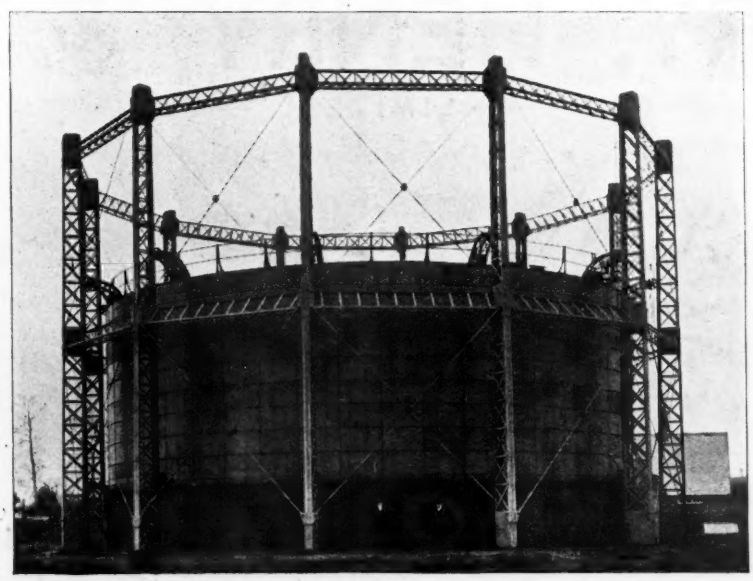

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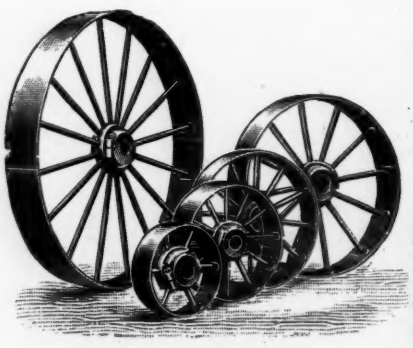

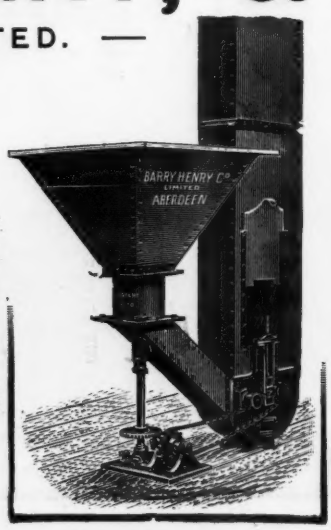

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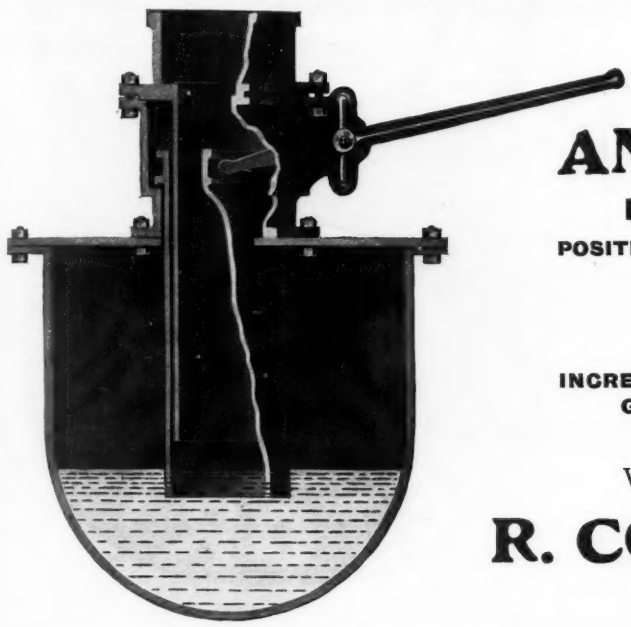

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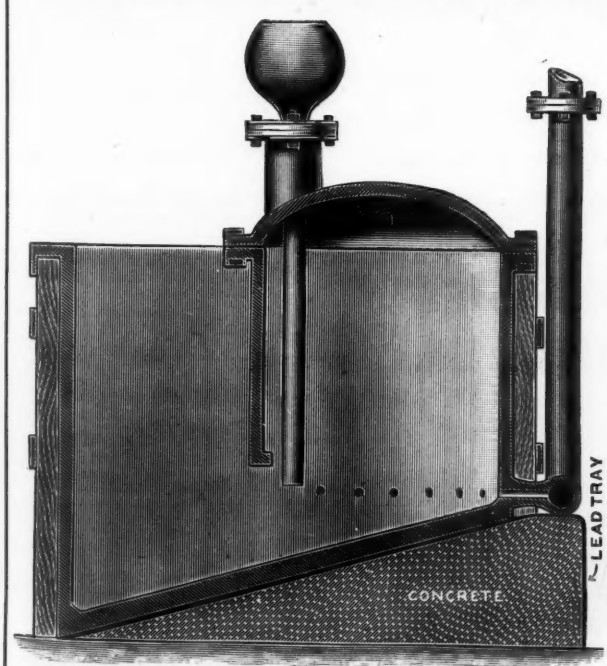

Section showing Williams and Fenner's Patent Outside Cracker Pipe as fitted to our Solid Lead Plate Saturator.

Williams' and Fenner's Patent Saturator with Outside Cracker Pipe, having the following

ADVANTAGES:—

1. **Equal distribution of Steam and Ammonia.**
2. **Perfect agitation and boiling of the Acid Liquor.**
3. **No possibility of local Alkalinity.**
4. **Consequently no formation of Blue Salt.**
5. **Sulphate is easily forced to point of discharge.**
6. **No incrustation.**
7. **No renewals of Cracker Pipe.**
8. **Capacity of output greatly increased.**

IT CAN BE APPLIED TO ANY EXISTING SATURATOR.

LICENCES TO MAKE MAY BE OBTAINED.

For full Particulars apply to the Sole Proprietors

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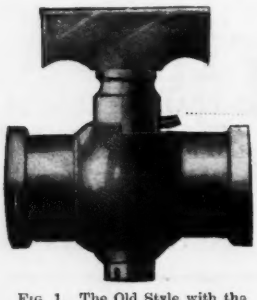

Fig. 1. The Old Style with the Old Trouble.
Note the Pin **A.**

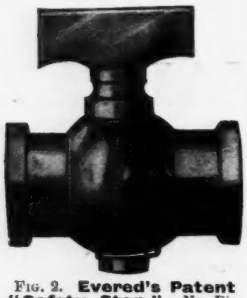

Fig. 2. **Evered's Patent "Safety Stop."** No Pin. No trouble.

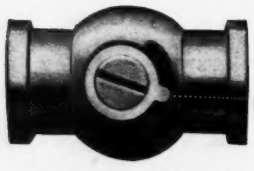

Fig. 3. Underside showing "Safety Stop" in lieu of Pin.

EVERED'S PATENT "SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

EVERED'S PATENT "SAFETY STOP"

renders the old Stop Pin unnecessary and is an absolutely **Safe and Permanent Stop.**

The projection shown in Fig. 3, marked **B,** working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

Any fitting specifically so ordered will be made with the "Safety Stop."

EVERED & CO., LTD.,

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Surrey Works, SMETHWICK.

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FOR

MANUFACTURED FROM OUR CAREFULLY SELECTED AND WELL SEASONED STOCK OF OLD MINE FIRE CLAY.

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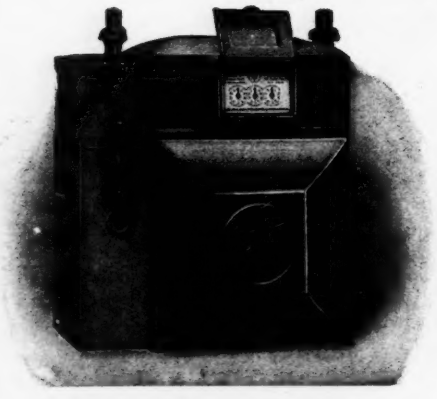

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Prepayment Wet Meters in Cast-Iron Cases.

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Welsbach LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

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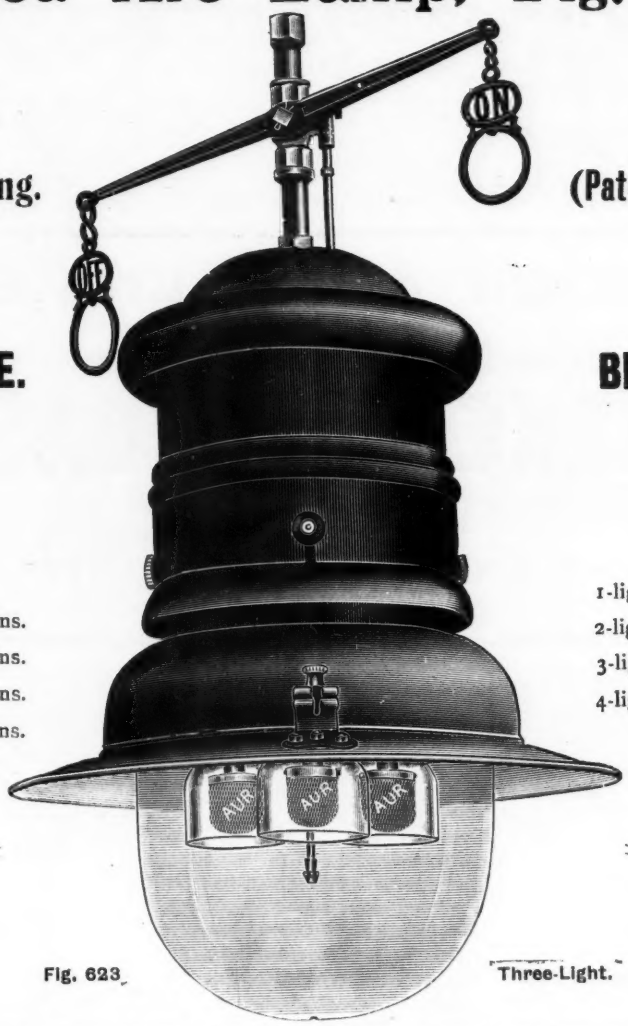

Fig. 623. Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*		*Gas per hour.*	*C.P.*	*Steel.*	*Copper Case.*
1-light	4 feet	125	**30/-**	**5/-** extra.	3-light	12 feet	400	**52/6**	**6/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.	4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . .	*80*	*18*	*18*	*12*

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made

Welsbach Mantles, each **6d.** subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

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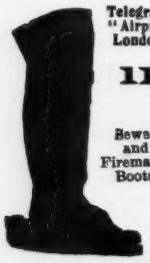

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Gas Bags for repairing Mains. All Seams Stitched and Taped.

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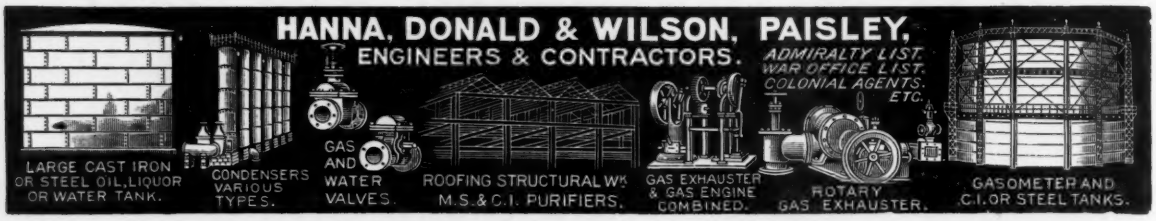
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VERY FREE FROM IMPURITIES.

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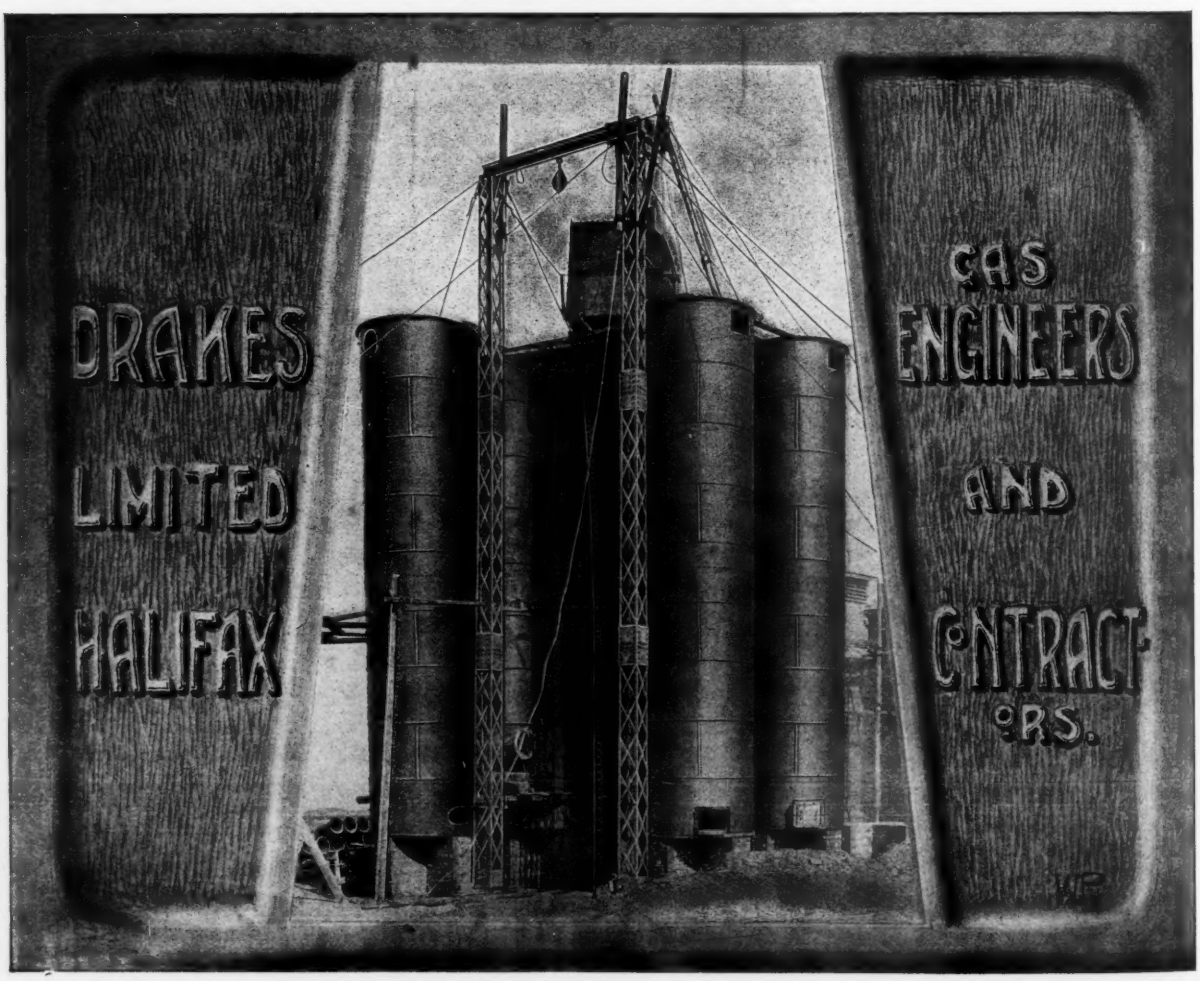

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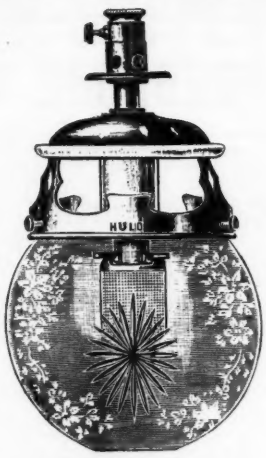

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Stiffest Gales
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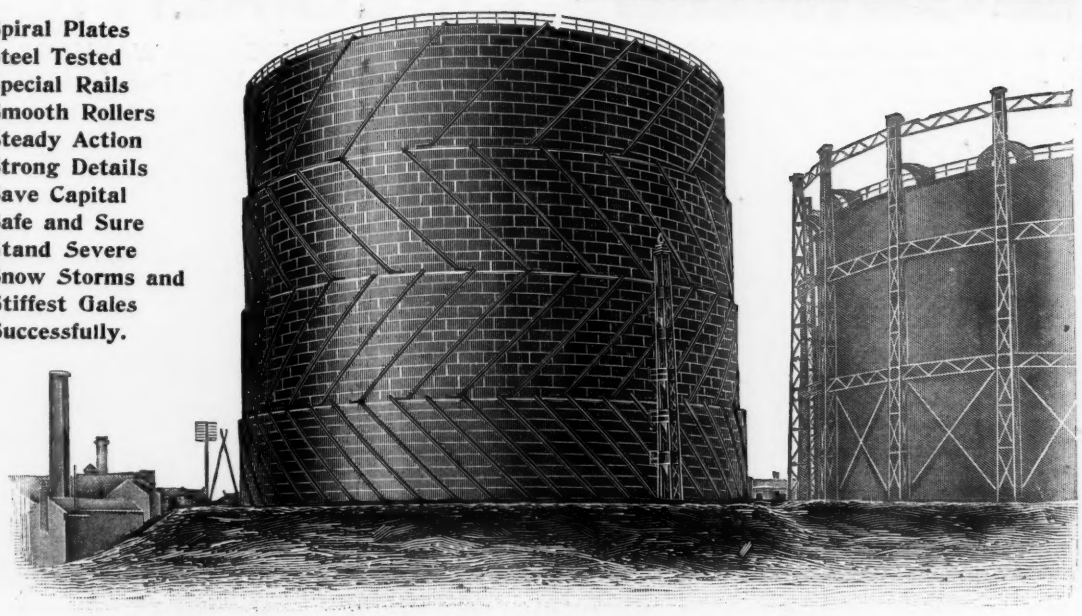

From a Photograph showing the conversion [of a Two-Lift] Guide Framed Holder to a Four-Lift Spiral Holder of 3½ million cubic feet capacity, for the Newcastle and Gateshead Gas Company, to Plans and Specifications of W. D. GIBB, Esq., M.Inst.C.E., Engineer.

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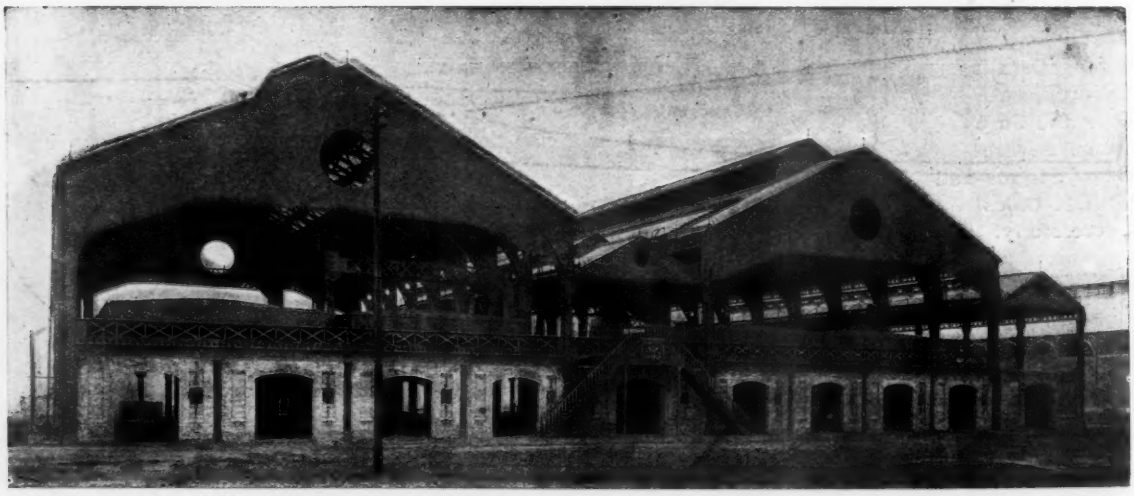

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